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Antibiogram of Staphylococcus Aureus and Escherichia Coli Isolated from Beef and Aprons of Beef Vendors in Abraka and Obiaruku, Delta State, Nigeria.Oliseloke, A.C. *¹*Department of Pharmaceutical Microbiology, Faculty of Pharmacy, Delta State University, Abraka, Nigeria¹**Author for Correspondence: oliseloke@yahoo.com/+234-806-639-0868***Abstract**

Escherichia coli and Staphylococcus aureus constitute part of the causes of food and water borne diseases in humans. This study was designed to investigate the presence of microbes in beef and aprons of Beef Vendors in Abraka and Obiaruku, Delta State, Nigeria and to determine its antimicrobial susceptibility to common antimicrobial agents. A total of one hundred (100) samples of beef specimen were obtained. Fifty samples meat (1g) were collected from different abattoir located in Abraka and 50 samples from apron of vendors working in the abattoirs was also collected using sterile swab stick. Bacteria were isolated via selective cultural procedures and biochemical tests were carried out to confirm the presence of isolates from the 100 samples analyzed. Staphylococcus 48(48 %) was found to be most frequent isolated organisms, followed by the Proteus vulgaris 11(11%) and Escherichia coli 1(1 %). In this study, varying level of resistance of S. aureus to antimicrobial agent was observed; 0.4% to Ceftriazone, 90% to Amoxicillin, 83% to Ampiclox, 83% to Chloramphenicol respectively with the maximum resistance to Amoxicillin and E. coli having resistance to Amoxicillin, Ampiclox and Chloramphenicol but susceptible to Ceftriazone. Identification of multidrug resistant bacteria, such as E. coli, and S. aureus from meat and apron of meat vendors poses considerable risk on the consumers. Therefore, there is need to implement good hygienic practices among the food handlers.

Keywords: Beef, Apron, Staphylococcus aureus, Escherichia coli, Resistance.

Introduction

Contamination of meat with pathogens that constitutes a serious public health concern is well- documented (Cohen *et al.*, 2007). Abattoirs have now become good sources of infection and pollution, attracting wild carnivores and domestic rodents owing to poor facilities for slaughtering and disposal (Adeyemo, 2012). Apart from improper processing methods, marketing practices of meat consumed by a good number of people is a major area of concern (Okoli *et al.*, 2006). In most parts of Nigeria, fresh meat is usually hawked on trays or displayed on table surfaces in the open markets without proper hygiene and usually kept at an ambient temperature.

Previous studies have acknowledged bacterial pathogen contamination of raw meat (Ameh and Amadusa, 2006; Uche and Agbo, 1985). Reports of epidemiological survey have suggested that meat product is a major cause of diarrheal illness which accounts for 36 percent of mortality cases in Nigeria (FAO/ WHO, 2002). Foods that are contaminated with antibiotic- resistant bacteria may also constitute a great threat to public health, as resistance determinants could be transferred to some other pathogenic bacteria. This can result in the compromising treatment of serious bacterial infections. The prevalence of antimicrobial resistance amid food-borne pathogens has increased in the recent decades (Van *et al.*, 2007). This increase is attributed to the selection of pressure created by using antimicrobials in food producing animals, in addition to unguided use of antibiotics by humans in developing countries. Food poisoning

could be caused by ingesting food that is contaminated with viruses, bacteria, chemicals, and chemicals such as lead or cadmium (Ameh and Amedusa, 2007). Commonly observed symptoms include nausea, vomiting, diarrhoea, feeling weak, fever, stomach pain and chills. *Staphylococcus aureus* bacteria for example are usually found on skin, in the nose, saliva, throat and infected eyes, saliva, throat and human bowel. They can be found in slimy yellow mucus which drops from nostrils or is being coughed out when someone has a cold or lung infection. A study conducted in Qassira Province, Saudi Arabia analyzed the food borne illness surveillance data for the year 2006. During the period of study period, 31 food borne illness outbreaks comprising 251 cases, were reported. The commonest causative agent was *Salmonella spp*, followed by *S. aureus*. The *Escherichia coli* are bacteria found mostly on in digestive tracts of humans and animals. According to the report of 2011 centre for disease control and prevention (CDC), about 48 million Americans usually get sick, 128,000 are hospitalized and 3,000 persons die each year as a result of food poisoning also identified as food borne disease. This may result from inadequate food handling. A number of bacteria in small quantities are usually not harmful to the majority of healthy adults as human body is capable of fighting them off. Nonetheless the trouble starts when some bacteria and some other harmful pathogen increase and spread, which may happen when food is not cautiously handled.

Food contamination with antibiotic-resistant bacteria can also be a major threat to public health, as antibiotic resistance determinant can be transferred to other pathogenic bacteria potentially compromising the treatment of severe bacterial infections. Antimicrobial resistance could develop from the use of antimicrobial agents in livestock. Antimicrobial agents have been used in livestock and poultries since 1950s to treat infections and to improve growth and efficiency. This study was carried to establish the prevalence and evaluate antibiotic resistant resistance profile of *Staphylococcus aureus* and *E coli* from beef and aprons of meat vendors in Abraka and Obiaruku.

Materials and Methods

Media: Nutrient agar, MacConkey agar, mannitol salt agar, Peptone water, Nutrient broth, Muller Hinton agar, Crystal violet and Safranin were used for culture and biochemical testing of the isolates.

Equipment/Apparatus

Incubator, autoclave, wire-loop and lead acetate paper.

Collection of Samples:

A total of one hundred (100) samples were collected made up of fifty (50) samples obtained from meat samples from abattoirs situated in Obiaruku and Abraka and the fifty samples from Aprons of butchers working in these abattoirs using swab sticks that are sterile and appropriately labelled. After collection, these swab sticks were properly sealed and stored at temperature of 4°C in the fridge prior to testing. Samples were tested within 2 hours of collection and meat inoculated in test tube containing nine (9ml) of sterile water.

Isolation of Bacteria

The work area was disinfected by swabbing with a disinfectant. The MacConkey and Mannitol salt agar was prepared according to the manufacturer's instruction and dispensed aseptically into nineteen (19 ml) sterile petri-dishes, with the aid of a sterile wire loop. Inoculums were picked from the incubated nutrient agar containing samples that had growth and then streaked on the prepared MacConkey agar plates. Thereafter, the petri-dishes were observed for microbial growth.

Identification of the Bacterial Isolates

The bacterial isolates were subjected to various biochemical tests to properly identify them. These biochemical tests included; Gram staining, catalase test, motility test, hydrogen sulphide test, indole test, fermentation and coagulase test.

Antimicrobial Susceptibility Test

Antimicrobial susceptibility test was carried out using disc diffusion test according to Bauer *et al.* (1965). The following antibiotics were used; Amoxicillin (30 µg), Chloramphenicol (30 µg),

Ceftriazone (25 µg) and Ampiclox (30 µg) where the concentrations are the break point of the respective antimicrobial agents.

Results

Out of the one hundred (100) samples that were collected fifty (50) samples from aprons while the other fifty (50) samples were collected from meat. Relevant biochemical tests were carried out and forty (40) isolates were recorded.

Twenty- eight (28) *Staphylococcus aureus* were isolated out of the fifty samples collected from apron, while twenty (20) isolates of *S. aureus* were obtained from meat samples. *E. coli* was isolated which was just one (1). Another gram-negative bacterium was isolated which was *Proteus vulgaris* (three isolates from apron and eight were isolated from meat as shown in Table 1).

Table 1: Prevalence of Microorganisms among collected samples.

Sample	<i>S. aureus</i>	<i>E. coli</i>	<i>P. vulgaris</i>
Apron (n= 50)	28 (28%)	1(1 %)	3 (3%)
Beef (n= 50)	20 (20%)	-	8 (8%)
Total = 100	48 (48 %)	1 (1%)	11 (11 %)

Key: n = sample size of specimen

In this study as shown in figure 1 and 2, varying level of resistance of *S. aureus* to antimicrobial agent was observed Ceftriazone (0.4%), Amoxicillin (90%), Ampiclox(83%), Chloramphenicol (83%) and total resistance to Amoxicillin. *E. coli* had a complete resistance to Amoxicillin, Ampiclox and Chloramphenicol but was susceptible to Ceftriazone.

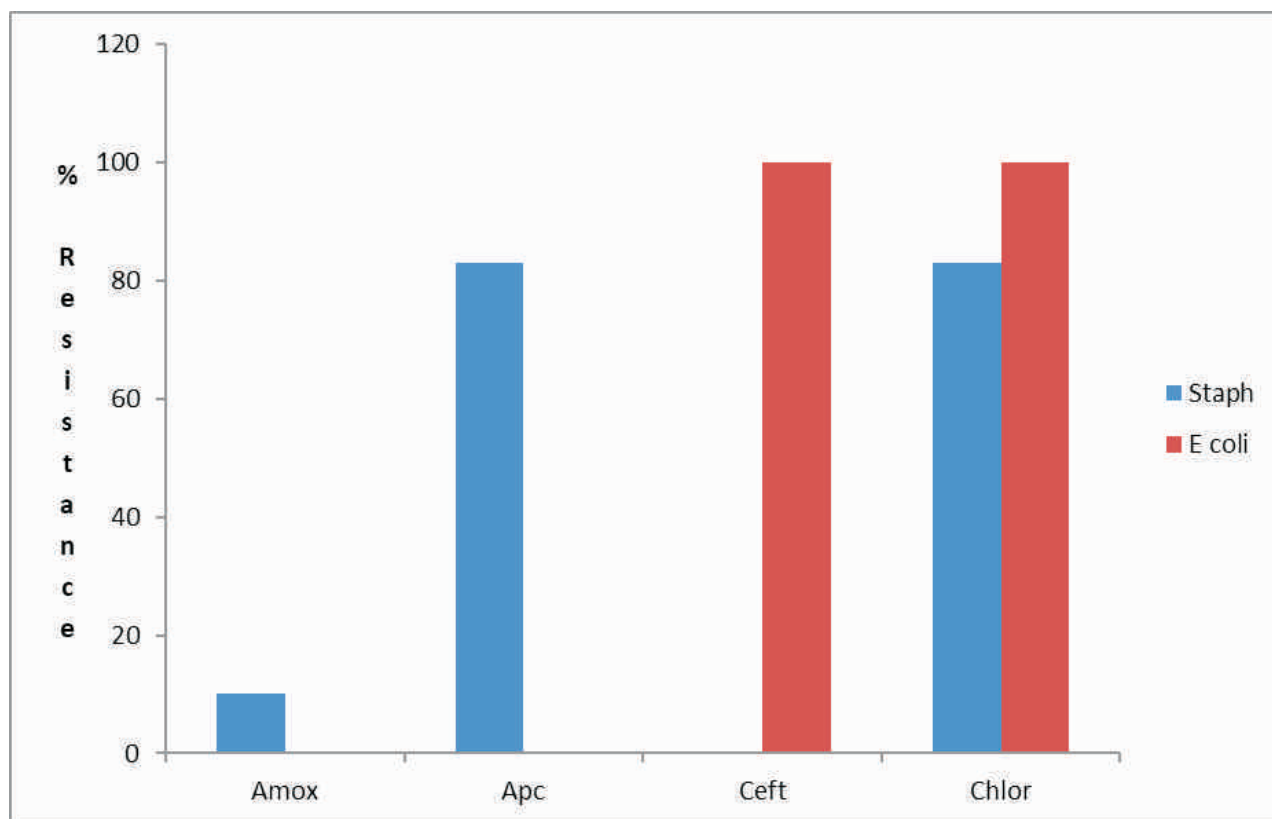


Figure 1: Resistant Profile *S. aureus* and *E. coli* against various antibiotics

Key: Amox= Amoxicillin, Ceft. = Ceftriazone, Apc. =Ampicillin, Chlor. = Chloramphenicol.

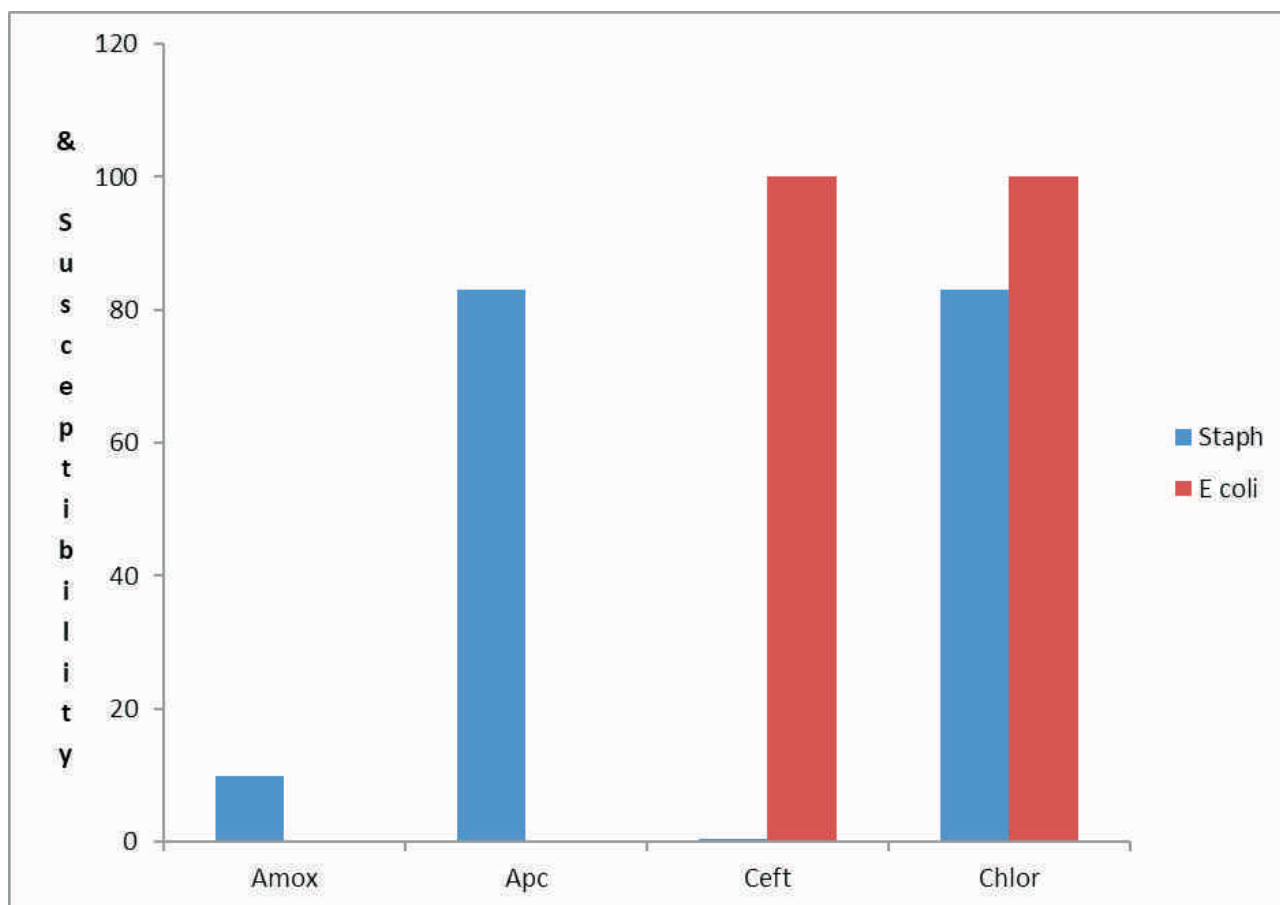


Figure 2: Susceptibility profile of *S. aureus* and *E. coli* against various antibiotics

Discussion

The contamination of food with antibiotic resistant bacteria is a threat to health of the public, because the antibiotic resistance factor can be transferred to other pathogenic bacteria, potentially compromising the treatment of severe bacterial infections. This study describes the prevalence of bacteria pathogens in aprons of meat vendors and retail meat sold in Abraka and Obiaruku environs, Delta State. Out of one hundred (100) samples collected, 48 (48 %) were contaminated with *Staphylococcus aureus* species 20 (20%) from beef and 28 (28%) from apron samples showing the highest prevalence compared to other microorganism isolated. This is comparable to the result obtained in Akure, Nigeria where *S. aureus* was isolated more than *E. coli*, *Corynebacterium species*, *Bacillus subtilis*, *Samonella species* and *Lactobacillus salivanus* (Onibi and Osho, 2006). In contrast, *E. coli*, *Proteus* and *Pseudomonas* were most isolated in a study conducted in Jos Nigeria with 16%, 14% and 9% respectively while *S. aureus* was least (Ameh and Amandusa, 2007). The

elevated rate of isolation of *Staphylococcus aureus* in this study points to poor hygiene of the handlers of meat during the stage of processing even the lack of proper sterilization of working surfaces and utensils (Plaatjies *et al.*, 2004). Enterotoxin producing *S. aureus* is the common cause of food- borne human illness throughout the world with red meat and poultry being the most implicated (Nomannno *et al.*, 2005). The eating of expired foods may enhance your risk for some sickness and illness or conditions. An estimated 2 million people who died from diarrhoea disease that were food- borne globally. *Staphylococcus aureus* food poisoning occurs from the ingestion of food containing preformed enterotoxins of Staphylococcal origin (Loir *et al.*, 2003). In most cases food handlers carrying enterotoxin producing *Staphylococcus aureus* in their hands or nostrils which are the major sources of food contamination because of improper handling and subsequent storage at temperatures which permits growth of *S. aureus* and production of enterotoxins (Argudin *et al.*, 2010). Methicillin resistant *S. aureus* strains are

now reportedly been isolated in livestock and various food especially meat and milk, posing a threat over a potential spread to consumers via food chain. Contamination of meat with MRSA is mostly as a result of cross contamination from the colonized body sites of the animals to the carcass, through the environment of processing facilities or by people involved in the handling of carcasses or meat (Weese *et al.*, 2010).

Proteus vulgaris had high prevalence in the meat samples than the apron samples as revealed from the result, where the meat samples showed a total result of 8 (8%) which tested positive for *Proteus vulgaris* as against 3(3%) in apron sample which overall makes a total of 11 (11%) from the total of hundred (100) samples collected and evaluated. The result of the study has shown that, out of the 100 apron and beef samples collected, 1(1%) was isolated from the apron which is in line with a previous report (Akagha *et al.*, 2015).

We recorded a high percentage of *E. coli*. However, the *E. coli* had a lower prevalence compared to 48% in *S. aureus* and 11% in *Proteus vulgaris*. The result obtained in this study is at variance with the result obtained by Agbeyegbe and Uraih (1982), who obtained a high prevalence rate of *E. coli* in samples of raw beef meat.

These results are clear indication of inadequate sanitary environment where the animals are being slaughtered and sold. These animals are usually slaughtered on the floor which is not properly disinfected every after each kill, with butchers and retailers walking between carcass as they transact their business, while those in the market are displayed on tables in the open for sale. Nkanga and Uraih (1981) reported that meat is regularly found to be contaminated because of poor sanitary condition of the environment during slaughter, transportation, usage and handling. The antimicrobial susceptibility results revealed that most of the *Staphylococcus aureus* isolates were susceptible to ceftriaxone with 0.4% of the isolates exhibiting resistance but isolates of *S. aureus* proved to be resistant of amoxicillin 36 (90%), ampiclox 33(83%) and chloramphenicol 33(83%). The isolate of *E. coli* was resistant to amoxicillin, ampiclox and chloramphenicol but showed

susceptibility to ceftriaxone. The pattern of resistance could be attributed to frequent use of amoxicillin, as first line drug for patients presenting with diarrhoea illness (Adeleye *et al.*, 2008) and also its use in food animals for therapy, prophylaxis and growth promoter in the environment (Okoli *et al.*, 2006). The emergence of resistant bacteria and resistance genes following the use of antimicrobial agents in food animals is relatively well documented and it appears that all antimicrobial agents may select for resistance (White *et al.*, 2001). The health consequences of resistant pathogens on humans include serious infections and rising frequency of failures of treatment. Patients may experience prolonged duration of illness, increased frequency of blood stream infections, greater likelihood of hospitalization and increased mortality (Angulo *et al.*, 2004).

Conclusion

Identification of multidrug resistant bacteria, such as *E. coli*, and *S. aureus* from meat and apron of meat vendors poses considerable risk on the consumers. There is critical need for applying good hygienic practices amongst the food handlers. We recommend the use of disposable aprons by the meat vendors as these will go a long way in reducing the transfer and the wide spread of food-borne pathogen.

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