Original Research Article

MICROBIAL ASSESSMENT OF SLAUGHTER SLABS IN ADO EKITI CENTRAL ABATTOIR

ABSTRACT

This study was aimed at assessing the presence of microbes in the selected slaughter slabs in other to inform the Animal scientists, Public health workers, Butchers and Meat vendors to know the risk pose to human health with contaminated meat.

A total of 50 sterile swab sticks were used to collect the samples from five abattoir slaughter slabs surfaces in Ado-Ekiti central abattoir with ten swab samples from each slaughter slab. After collection the samples were immediately transported to laboratory for microbiological studies. The samples were placed on trypticase-soya-agar (TSA), for trophic bacteria and Sabouraud-glucoseagar (SGA) supplemented with chloramphenicol for fungi. Petri dishes were incubated at 37ºC for 48 - 72 h while the cultures were observed daily under a stereoscopic microscope for presence of bacterial colonies and or fungal mycelium. The results revealed that the mean value of bacterial count was 1.83×10^5 CFU/ml while that of the fungal count was 0.59×10^5 CFU/ml. A total of eight strains of bacteria comprises of gram positive and gram negative bacteria were isolated from all the samples with *Staphylococcus aureus* had the highest percentage of occurrences (33%), followed by *Escherichia coli* (26%), *Pseudomonas aureginosa* (19%), while other prevalence bacteria have 5% each. Four strains of fungi were isolated from the samples with *Aspergillus flavus* being the most frequently occurring fungi accounting for approximately 40% of the total fungal count followed by the *Penicillium* species (28%) while the least frequently occurring fungi accounting for 8% of the total fungal count in the study. The study revealed higher potential of contamination of meat from the slaughter slab surfaces. It could be concluded that there was poor level of sanitation and lack of knowledge on hygienic practices to be followed in central abattoir in Ado-Ekiti. Thus there is need to educate butchers for practicing good sanitation and meat handling techniques in the abattoirs.

Keywords: Abattoir; slaughter slabs; bacterial; fungi, sanitation.

1. INTRODUCTION

Food borne diseases occur commonly in developing countries particularly Africa because of the prevailing poor food handling and sanitation practices, weak monitoring and regulatory systems, lack of financial resources to invest in safer equipment and lack of education for food-handlers and advocacy for food safety (WHO, 2004), of all foods intended for humans consumption, those of animal origin tend to be hazardous most to human health unless the principles of food hygiene are employed. Food borne diseases have been considered as an imperative health problem in different countries

(Gill *et al*.,1996). Animal products such as meats, fish and their products are generally regarded as high risk commodity in respect of pathogen contents, natural toxins and other possible contaminants and adulterants (Yousuf *et a*l., 2008).

The Food and Agricultural Organization (FAO) of the United Nations and the World Health Organization (WHO) state that illness due to contaminated food is perhaps the most widespread health problem in the contemporary world and an important cause of reduced economic productivity (Edema *et al*., 2005).

Slaughter slab is a facility which is made up of concrete slab and metal roof that is approved and licensed by the authority for the purpose of slaughtering and dressing of animals for human consumption (FDA, 2013). In Nigeria, there are a number of public slaughters houses and a few private meat processing plants distributed along the country, where the meat vendors buy their meat they sell to the public. Serious consequences relating to national productivity and development can arise from lack of hygiene and sanitation in slaughtering and dressing facilities.

In developing countries like Africa, there is no precise data about the incidence of food borne out breaks and it seems to be higher compared to developed countries. Meat is a good source of animal protein and the expectation of all consumers is to purchase meat that is safe and wholesome for consumption (Govindarajan, 1990). Meat produced in an unhygienic condition could pose threat to the health of the consumers as well as impair the keeping quality of such meat. Contamination of meat can result from contaminated working surfaces, equipments and the workers hands used in the processing (Lues *et al*., 2007). The quality of water used in meat processing at the abattoirs and butcher shops also play a major role in reducing or increasing meat contamination. Microbial contamination of meat products is unavoidable consequence of meat processing (Jones *et al*., 2008). Without proper hygienic control, abattoirs environment can act as important sources of bacterial contamination (Gill *et al*., 1998). No comparable data were available regarding the assessment of food safety practice, food borne diseases and microbial load of slaughter slabs in Ado Ekiti central abattoir. These factors could hinder government ability to accurately apply measures on the impact of food contamination problems on public health. Therefore, the present study was designed to determine microbial load and pathogenic organisms present in Ado Ekiti central abattoir slaughter slabs.

2. MATERIALS AND METHODS

2.1 Study area

The microbial assessment was carried out from December 2021 to January 2022 in Ado-Ekiti central abattoir, Ekiti State, South West Nigeria.

2.2 Study Design

A cross sectional study design was employed whereby a simple random sampling of slaughter slabs surfaces was carried out. Samples from slaughter slabs surfaces from abattoir were collected aseptically, processed and analyzed.

2.3 Sample collection

A total of 50 samples were collected from Ado Ekiti central abattoir using sterile swab sticks. The samples were collected from five abattoir slaughter slabs surfaces with ten swab samples taken from each slaughter slab. After collection the samples were immediately transported to laboratory for microbiological studies within 6 h (of collection). The samples were analyzed for microbial quality as described by FAO (2007) at the screen house of the Microbiology Unit of the Department of Science Laboratory Technology of Federal Polytechnic, Ado- Ekiti, Ekiti State located in the South West Nigeria. The ambient temperature fluctuated between 25-31°C during the period of the experiment.

2.4 Microbial counts

The samples were placed on trypticase-soya –agar (TSA), for trophic bacteria and Sabouraud-glucose-agar (SGA) supplemented with chloramphenicol for fungi. Petri dishes were incubated at 37°C for 48 - 72 h while the cultures were observed daily under a stereoscopic microscope for presence of bacterial colonies and or fungal mycelium. The media used were weighed out and prepared according to the manufacturer's specification, with respect to the given instructions and directions. The serial dilution method was used for total microbial counts.

2.5 Identification of microbes

Plates were incubated at 37°C for 24 -48 hours. Discrete colonies were sub cultured into fresh agar plates aseptically to obtain pure cultures of the isolates. Pure isolates of resulting growth were then stored at 4°C and used for further identification of bacteria. Colonies identified as discrete on nutrient agar were carefully examined macroscopically (Olympus light microscope, Germany) for cultural characteristics such as the shape, colour, size and consistency. Gram staining as well as appropriate biochemical tests were carried out according to standard procedures (Oyeleke & Manga, 2008). Pure isolates of resulting growth were identified using morphological and biochemical methods as described by Lennette *et al*., (1985) and Jolt *et al*., (1994). The number of occurrence of each identified bacterium and fungus was recorded with its percentage occurrence (Tables 2 and 3). The sterility of each batch of test medium was confirmed by incubating one or two uninoculated plates along with the inoculated tests. The uninoculated plates were always examined to show no evidence of bacterial growth.

2.6 Statistical analysis

All the results of the laboratory investigations were subjected to analysis of variance (ANOVA) according to the standard procedure described by Steel and Torrie (1980). Duncan multiple range test was used to compare means found to be statistically significant ($p < 0.05$) as described by Obi (1990).

3. RESULTS AND DISCUSSION

The mean value of the bacterial count from all the samples varies from 1.37 x 10^5 to 2.25 x 10^5 CFU/ml while the mean value for fungal count varies from 0.38 x 10^5 to 0.88 x 10^5 CFU/ml with a significant difference ($P < .05$). The mean total microbial count for all the samples was 2.42 × 10^5 CFU/ml (Table 1). The highest and lowest microbial counts were observed in Slaughter slab 1 (2.80 x 10^5 CFU/ml) and Slaughter slab 5 (1.90 x 10^5 CFU/ml) respectively.

A total of eight strains of bacteria comprises of gram positive and gram negative bacteria were isolated from all the samples with *Staphylococcus aureus* had the highest percentage of occurrences (33%), followed by *Escherichia coli* (26%), *Pseudomonas aureginosa* (19%). However, others prevalence were *Bacillus* species, *Vibrio cholera, Proteus mirabilis, Shigella dysenteriae* and *Klebsiella pneumonia* having the least percentage of occurrence with 5% each. A total of four strains of fungi were isolated from the samples with *Aspergillus flavus* being the most frequently occurring fungi accounting for approximately 40% of the total fungal count followed by the *Penicillium* species 28% (Table 3). The least frequently occurring fungi in the study was *Rhizopus* species accounting for 8% of the total fungal count in the study.

Table 1. Mean values of microbial load of slaughter slabs in Ado-Ekiti central abattoir.

Slaughter slab	Bacterial count (CFU/ml)	Fungal count (CFU/ml)	Total microbial count (CFU/ml)
Slab 1	1.92 x 10^5	0.88 x 10^5	2.80 x 10^5
Slab 2	2.08 x 10^5	0.52 x 10^5	2.60 x 10^5
Slab 3	1.37 x 10^5	0.70 x 10^5	2.07 x 10^5
Slab 4	2.25 x 10^5	0.47 x 10^5	2.72 x 10^5
Slab 5	1.52 x 10^5	0.38 x 10^5	1.90 x 10^5
Total	9.14 x 10^5	2.95 x 10^5	12.09 x 10^5
Mean	1.83 x 10^5	0.59 x 10^5	2.42 x 10^5

Table 2. Number of individual bacterium encountered in the samples.

Bacterium	No of occurrence	Percentage
Staphylococcus aureus	14	33%
Escherichia coli	11	26%
Pseudomonas aureginosa	8	19%
Klebsiella pneumonia	2	5%
Bacillus sp	2	5%
Shigella dysenteriae	2	5%
Vibrio cholera	2	5%
Proteus mirabilis	2	5%

Total	43	100

Table 3. Number of individual fungus encountered in the samples

Fungus	Number of occurrence	Percentage of total number (%)
Aspergillus flavus	10	40
Aspergillus niger	6	24
Penicillium species	7	28
Rhizopus sp,	2	8.0
Total	25	100

DISCUSSIONS

The total microbial counts observed in this study ranged between 1.90 x 10^5 and 2.80 x 10^5 CFU/ml these values exceed the FAO/WHO (2004) standard limit of 1 .0 x 10^5 CFU/ml for food products and water. This poses a serious public health concern to the consumers of these meats and is an indicator of the level of hygienic practices at the slaughter slab in Ado-Ekiti central abattoir. The total mean bacterial load of 12.09 x 10^5 CFU/ml obtained from the slaughter slabs in this study was higher than the value reported by (Fasanmi *et al.*, 2010) which is 5.54 CFU/m1 from meat sellers" tables from various markets in Ibadan, Nigeria. The Hazard Analysis Critical Control Point (HACCP) concept is used to identify microbiological vulnerable points in the food production process and processing, and to determine the most appropriate methods of control to be applied. Usually such methods include improved handling techniques, sanitation, monitoring of temperature and more intensive supervision (Edema and Omemu, 2004). The microbiological safety of food is achieved by ensuring the absence of pathogenic microorganisms and by all means preventing their multiplication (Okonko *et al.*, 2008). The highest total microbial counts was observed in slaughter slab 1 at 2.80 x 10^5 CFU/ml and lowest total microbial counts was observed in slaughter slab 5 at 1.90 x 10^5 CFU/ml this is an indication that the slaughter slab 1 is easily accessed by the butchers and many animals are slaughtered and dressed on the slab which tends to increase the rate at which microorganisms were growing there since meat contains sufficient nutrient needed to support the growth of microorganisms (Magnus, 1981). The high microbial load obtained from the slaughter slab is an indication of inadequate cleaning and poor or absence of sterilization of the slaughter slab, which are usually washed with water only. The presence of bacterial pathogens in meat contact surfaces may contribute to the contamination of meat (Endale & Hailay, 2013).

In this study *Staphylococcus aureus* had the highest percentage of occurrences (33%), followed by *Escherichia coli* (26%), *Pseudomonas aureginosa* (19%). However, others prevalence were *Bacillus sp, Vibrio cholera, Proteus mirabilis, Shigella dysenteriae* and *Klebsiella pneumonia* having the least percentage of occurrence with frequency of 5% each. The bacterial contaminants of samples in the study were *Staphylococcus aureus, Escherichia coli and Pseudomonas aureginosa.* Similar bacterial contaminants have been reported by other workers in foods, water and environmental samples (Omoregbe *et al*., 1992; Enabulele &Uraih, 2009; Sobukola *et al*., 2009, Ukut *et al*., 2010). Biological contaminants such as bacteria, viruses, fungi, protozoa and helminthes constitute the major cause of food-borne diseases with varying degrees of severity, ranging from mild indisposition to chronic or life-threatening illness, or both. In developing countries, such contaminants are responsible for food borne diseases such as cholera, campylobacteriosis, *E. coil* gastroenteritis, salmonellosis, shigellosis, brucellosis, amoebiasis and poilomyletis (Edema *et al*., 2005).

Staphylococcus species was the predominant isolate (33%) followed by *Escherichia coli* (26%) and this is in close agreement to previous reports by (Ukut *et al*., 2010; Okonko *et al*., 2009) where they isolated almost similar organisms from meat, sea-foods and other ready to eat food stuffs. The higher rate of contamination of meat with these organisms is an indication of deplorable state of poor hygienic and sanitary practices employed right from the abattoir.

Aspergillus flavus being the most frequently occurring fungi isolated from the samples which accounted for approximately 40% of the total fungal count followed by the *Penicillium* species 28% (Table 3). The least frequently occurring fungi in the study was *Rhizopus* species accounting for 8% of the total fungal count in the study. The findings of this study is in conformity with that of Bankole *et al*. (2005) who reported the presence of *S. auerus, Bacillus* species, *E. coli, Pseudomonas* species, *Sacchromyces* species, *Rhizopus* species and *Aspergillus* species in the working surfaces in abattoirs and palms of meat vendors in Abeokuta Metropolis, Ogun State, Nigeria.

4. CONCLUSION

The high microbial load on the processing facility surfaces in this study underscores the poor level of personnel hygiene and poor sanitation at the abattoir. Based on the bacteria isolated and bacterial load on different surfaces in the abattoirs, meat could be contaminated by contact with contaminated surfaces and equipment in the abattoirs to pose public health hazards (Endale & Hailay, 2013). Thus to safeguard the public against the risks of food borne infections, there is need to frequently educate butchers and meat vendors on the adverse effects of meat contamination on public health and they should also be educated on practicing good sanitation and meat handling techniques in the abattoirs. However, the meat vendors/retailers should observe strict hygienic measures such as daily washing of their slabs before and after dressing of carcasses. This should be followed by a consistent sanitization of working spaces and equipment used in the dressing of carcasses meant for public consumption. Nevertheless, the public must be enlightened on the need to properly cook meat before eating them.

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