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Bacteriological Quality of Chicken Meat Produced Under Different Processing Conditions

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Abstract: The bacteriological quality of chicken meat produced under different processing conditions was analyzed to ascertain the microbial load and the distribution of bacteria that may be present and hence to deduce the danger of such bacteria on the chicken. The results obtained showed a total bacterial count of $5.78x10^4$ in fresh chicken, $4.04x10^4$ in frozen chicken, and $2.60x10^2$ in fried chicken. The outcome might be as results of different treatments confer on the meat. Bacterial isolated from the samples are *Bacillus* species*, Streptococcus* species*, Escherichia coli and, Staphylococcus.* the microbial load and as well as the isolate showed the chicken are exposed to contamination an indicator as well as potential pathogens as a result, there is need for good hygiene practice during processing and handling of the chicken.

Keywords*:* Bacteria, Chicken, Pathogens

INTRODUCTION

Animal proteins such as meat and fish products are usually considered as high threat commodities in respect of pathogen contents, fecal *coliforms, staphylococci,* sulfate-reducing anaerobic germs, and *Salmonella* natural toxins, and other possible contaminants and adulterants (Adamou *et al,* 2020 *and* Yosuf *et al,* 2008). Foodborne infections and illnesses are some major international health problems with consequent economic reduction. It is a major cause of illness and death worldwide (Abebe et al, 2019). Recognizing this, the world health organization (WHO) developed its global strategy for food safety (Adak *et al,* 2005). In the developing world, food-borne infection leads to the death of many children and results in diarrhea (Zerabruk *et al*, 2019). The disease can have long-term effects on children's growth as well as on their physical and cognitive development (Adak *et al,* 2005). In the industrialized world, food-borne infection causes considerable illness heavily affecting the health care system (Adak *et al,* 2005). According to (Clarence *et al,* 2009) Foodborne diseases are diseases resulting from the ingestion of bacteria, toxins, and cells produced by microorganisms present in food. The intensity of signs and symptoms may vary with the amount of contaminated food ingested and the susceptibility of the individuals to the toxin (Clarence *et al,* 2009).

Meat is the most perishable of all important foods since it contains sufficient nutrients needed to support the growth of microorganisms (Magnus, 1981). The chief constituents of meat are water, protein, fat, phosphorus iron, and vitamin are also contained in meat. The major primary unit of meat

is called carcass. It represents the ideal meat after head, hide, intestine and blood. The edible parts of the carcass include lean flesh, fat flesh and edible glands or organs such as the heart, liver kidney, tongue and brain. Meat is considered the most nutritive source of protein consumed by human. Age and sex of animal has a major influence on the quality of meat that is produced from animal (Rao *et al*, 2009). Most meats have high water content corresponding to the water activity of approximately 0.99 which is suitable for microbial growth (Rao *et al,* 2009).

In recent years, demand and consumption of poultry meat and its products have increased due to advantages such as easy digestibility and availability. Pakistan's poultry industry is also growing day by day and broiler meat production has considerably increased up to 480 tones in 2006-07 as compared to 463 tones in the fiscal year 2005-06 (Economic survey 2006-07). Due to the increased demand and production, the routine monitoring of quality of poultry meat is required for production of a safer produced according to established standard for the consumption of public.

Processing of poultry carcass required intensive microbiological quality control procedures as contamination of food with pathogens is a major public health concern worldwide (Mead *et al,* 1994). Most countries all over the world are trying hard to improve food quality to overcome foodborne illnesses and rising consumer concern. In the united state approximately 76 million food borne illness are reported each year (Mead *et al,* 1999).

Microbial food safety and food borne infection are important public health concern world wide. There have been a number of foods borne illness resulting from the ingestion of contaminated foods such as chicken meats. Most of the pathogens that play a role in food borne disease have a zoonotic origin (Busani *et al,* 2006). Raw meat remain an important and probably the major source of human food borne infection with pathogenic bacteria. In spite of decades of effort it has been difficult to obtain food animals free of pathogenic bacteria.

Meat and poultry carcasses and their parts are frequently contaminated with pathogens which reach the carcasses from the intestinal tract or from fecal material on feed and feathers. Cross-contamination is a particular problem and several recommendations have been published to control pathogens throughout, the chain from hatcheries to the preparation in the home (Dincer and Baysa, 2004).

The microorganism including pathogens present on the surface increase in, number during slaughtering, processing and handling. Several studies have indicated that consumption of poultry meat has been associated with incidence of outbreaks of food borne Infection including salmonellosis (Prakash *et al*., 2005). Compylobacteriosis (Berrang and Dickens, 2000).

The results of numerous investigation of the bacteriology of food poisoning show that contamination with pathogenic bacteria primarily refer to Salmonella species, Campylobacter species, Staphylococcus species, Listeria species and then Yersinia enterocolitica, Escherichia coli and Clostridium perfringens.(Zivkovic, 1998).

Against such a background and recognizing an increase in consumer concerns and pressure in term of reducing such human societal and economic costs, there is considerable interest in the development and wider application of more robust and secure methods within poultry production and processing system. Special attention in poultry production is paid to the fact that live animals are hosts to a large number of different micro organisms residing on the skin feathers or in the alimentary tract. During slaughter most of these microorganisms are eliminated, but subsequent contamination is possible at any stage of the production process. From feather plucking, evisceration and washing to storage by cooling or freezing. Micro organisms from the environment equipment and operators hand can contaminate meat during the process the microflora change from, in general, gram-positive rods and

micrococci to, most frequently gram-negative bacteria in final products including entarobacteria, pseudomonas species, (Lidija *et al,* 2006) (Javadi and Safarmashsei, 2011).

One such system is hazard analysis and critical center point (HACCP) a systematic science based approach to process control designed to prevent, reduce or eliminate identified hazards in food products (Kukay *et al,* 1996). It is generally accepted that the HACCP approach is the most effective way of reducing or eliminating contamination during food processing.

susceptible to microbial contamination which can cause its to spoilage and food borne infections in human, resulting in economic and health losses (Komba *et al,* 2012). A great diversity of microbes inhabits fresh meat generally but different types of may become dominant depending on PH composition, texture, storage, temperature, and transportation means of raw meat (Erolini *et al,* 2006).

SAMPLE COLLECTION

Three sample of different kind of processed chicken where purchased in the market (Monday market) in Maiduguri metropolis Borno State Nigeria (fried, frozen and fresh) chickens respectively. The sample were aseptically collected in a clean polythene bag and were transported immediately to laboratory for further bacteriological analysis and it was carried out as described by the method of (Fawole and Oso, 2004).

SAMPLE PREPARATION

Ten (10) gram of each part of the sample of the three different kinds of processing chicken were cut using sterile blade and weighed out and homogenized in 90ml of sterile distilled water using a sterilized blender. Ten-fold serial dilution of the homogenates were made using sterile pipette as described by the method of (Fawole and Oso, 2004).

CULTURING, INOCULATION AND ISOLATION

All the chemical and reagent used were of analytical grades, media used in this study included nutrient agar as general media, other media with selective and differential media characteristic used were MacConkey agar, blood agar eosin methylene blue, and manitol salt agar. All media were prepared according to manufactures specification and were sterilized at 121oc for 15mins.

From the ten fold serial dilution the sample were plated in replicate on nutrient agar using a pour plate method and was then incubated at 37^{o}C for 24hrs. At the end of the incubation period colonies were counted using colony counter and was express as colony forming unit of the suspension (cfu). Discrete colony were picked from the nutrient agar and sub-cultured onto blood agar, macConkey agar, manitol salt agar and eosine methylene blue, it was then incubated at 37^{o}C for 24 hours, colonies were identified base on their growth and further gram staining and biochemical test was conducted to ascertained the isolates (Fawole and Oso, 2004). Biochemical tests such as catalase, coagulase and urease was performed to ascertain the isolates

RESULT PRESENTATION

TABULATION OF RESULT

TABLE 1; Total heterotrophic bacterial count on nutrient agar plate

Sample	Total bacterial count (cfu)
Fresh chicken	$5.78x10^4$
Frozen chicken	$4.04x10^4$
Fried chicken	$2.60x10^2$

Table 2: bacterial isolates

Sample	Bacterial isolates
Fresh chicken	*Escherichia coli*, *Bacillus* species, *Streptococcus species, and Staphylococcus aureus*
Frozen chicken	*Escherichia coli and Staphylococcus aureus*
Fried chicken	Bacillus species, Streptococcus species

DISCUSSION OF RESULT

Table 1 showed a total bacterial count of $5.78x10^4$ in fresh chicken, $4.04x10^4$ in frozen chicken and $2.60x10^2$ in fried chicken. The outcome might be as results of different treatment confer on the meat. Bacterial isolated from the sample in table2 are *Bacillus* species, *Streptococcus* species, *Escherichia coli and Staphylococcus* species by comparing the morphological and biochemical characteristic with standard reference organism. Bacteria isolated from this study have been found earlier in foods, environment and other places and their pattern is similar to previous (Clerence *et al,* 2009). According to Doyle (2007), food borne disease are diseases resulting from ingestion of bacteria toxins and cells produced by microorganism present in food during food handlers as poor hygiene is a factor. *Escherichia coli* and *Staphylococcus aureus* are normal flora in human and animals their presence in foods are indicated of the excessive human handling

The presence of these organisms in the fresh, frozen and fried chicken sample depicts a deplorable state of poor hygienic and sanitary practice employed in slaughtering processing, and packaging of chicken from the result obtain fresh chicken sample were contaminated with high level of *Staphylococcus aurues, Escherichia coli, Streptococcus* species and *Bacillus* species. This agrees to the previous reported by (Clarence *et al,*2009) who reported *Staphylococcus* species, *Ecoli*, *Bacillus* species, *Salmonella* species, and *Citrobacter* species. The frozen chicken sample were contaminated with *Staphylococcus aureus* and *Escherichia* species, this is similar to the reported by(okonko *et al,*2009) *Enterobacter* species, *Staphylococcus* species and *Ecoli* in palm of all frozen seafood processors/ handlers and water use by them. The fried chicken sample were contaminated with high level of *Bacillus* species an *Staphylococcus aureus* .

CONCLUSION

It is concluded that all the chicken meat samples analyzed appears to be contaminated with at least two bacteria but fresh chicken posses the highest microbial load. This is perharps because fried and frozen are at least subjected to some physical treatments.

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