

## Microbial Profile of Marketed Broiler Meat

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**Abstract:** Contamination of poultry meat with food borne pathogens remains an important public health issue, because it can lead to illness if there are malpractices in handling, cooking or post cooking storage of the product. This paper presents an investigation of the microbiological quality of poultry meat marketed in Tabriz was done. Bacteriological analysis was performed on 80 samples of fresh chicken meat. Samples were collected from retailers (kept in cooling showcases at +4°C) and then bacteriologically tested for the presence and counts of total bacterial count, *Staph.aureus*, *perfringens*, *Streptococcus*, *Salmonella* and *Coliforms*. Bacteriological tests were performed by means of Iranian standard methods of isolation and identification of individual species of bacteria numbers: 1810, 437, 356, 2197, 2198 and 2194. Results indicated that aerobic plate counts and fecal coliforms were particularly high in all the samples analyzed. Poultry meat samples. With regard to microbiological quality and contamination of chicken meat, of importance is the finding of *Salmonella* spp. (negative), *Staph aureus* (65%), *Clostridium perfringens* (83%), *Streptococcus* (100%) and *Coliforms* (100%). Also enumeration of these bacterial was done and mean of these bacterial was Total bacterial count (5.06515), *Staphylococcus* (4.79575), *Clostridium perfringens* (1.2749), *Streptococcus* (4.074), *Salmonella* (negative) and *Coliforms* (4.038). Results of this study demonstrated these high levels of microbial contamination reflect the poor hygienic quality of poultry meat under these conditions.

**Key words:** Broiler • Meat • Microbial • Food

### INTRODUCTION

Food borne diseases associated with the consumption of poultry meat and its processed products are of public health significance worldwide. The consumption of poultry meat increased worldwide within the last decades [1-3]. Competition for an increased share of the poultry meat market centers on lowering the price, thus making poultry more attractive for the consumer. Therefore, modern poultry processing requires a high rate of throughput to meet consumer demand. With complete mechanization and automation, the number of slaughtered birds in many processing plants can reach 12,000 birds per h [4]. During processing of poultry carcasses, microbial contamination inevitably occurs as a consequence of the processing procedures employed. At each stage of the process, ample opportunity exists for contamination of the carcass by microorganisms from the processing plant or by cross-contamination from other birds. Numbers of bacteria on carcass surfaces vary considerably at different stages of processing [5-7] and

increases and decreases in numbers have been demonstrated [8-11]. Two kinds of poultry slaughtering are used in Tabriz. One is an automated poultry slaughtering process established recently, whereby automated systems are used for scalding, plucking, eviscerating, rinsing and packaging carcasses. Carcasses are then stored at 4°C before sale to supermarkets. The second is traditional slaughtering, which is commonly practiced in shops under poor hygienic conditions. Thus, controlling microbial contamination in poultry meat during slaughtering, processing, storage, handling and preparation becomes a great challenge [12-14]. Against such a background and recognizing an increase in consumer concerns and pressure in terms 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 systems. Special attention in poultry meat production is paid to the fact that live animals are hosts to a large number of different microorganisms residing on their 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. Microorganisms from the environment, equipment and operators' hands can contaminate meat. During the process, the microflora changes from, in general, Gram-positive rods and micrococci to, most frequently, Gram-negative bacteria in final products, including enterobacteria, *Pseudomonas* spp., etc [15, 16]. One such system is hazard analysis and critical control point (HACCP), a systematic, science based approach to process control designed to prevent, reduce or eliminate identified hazards in food products [17, 18]. It is generally accepted that the HACCP approach is the most effective way of reducing or eliminating contamination during food processing [18]. This study is aimed at determining the microbial profile of marketed broiler meat in Tabriz city (center of East-Azerbaijan province).

## MATERIALS AND METHODS

Samples were collected between April 2010 and March 2010. A total of 80 poultry meat samples (Pectoral muscle) were randomly collected from 24 supermarkets, with poultry meat from industrialized slaughterhouses. All samples were sent to the laboratory of food hygiene in veterinary faculty of Tabriz branch Islamic Azad University in sterile bags at 4°C within  $\leq 2$  h. A portion (25 g) of each sample was placed into a separate sterile Stomacher bag with 225 mL of 0.1% sterile peptone water and then pummeled with a Mix I mixer. Samples were subsequently serially diluted in 0.1% sterile peptone water for bacterial analysis. Standard methods of Institute of standards and Industrial Research of Iran, NO: 1810, 437, 356, 2197, 2198 and 2194 for preparation, detection and enumeration of microorganisms, positive coagulase *staphylococcus aureus*, *clostridium perfringens*, *coliforms*, *salmonella* spp. and group-d streptococci in samples were used. The means were calculated for each organism from duplicate plate counts. All bacterial counts were expressed as log<sub>10</sub> colony-forming units per gram (log<sub>10</sub> cfu/g). The mean log<sub>10</sub> (x) value and SD were calculated on the assumption of a log normal distribution [19-24].

## RESULTS AND DISCUSSION

Results of microbial profile of broiler meat in Table 1 have been shown.

It is well documented that contamination of food with pathogens is a major public health concern worldwide [25]. Because of the relatively high frequency of contamination of poultry with pathogenic bacteria, raw poultry products are reported to be responsible for a significant number of cases of human food poisoning [26]. In the absence of hygienic conditions, the birds may be highly exposed to bacterial pathogens such as *L. monocytogenes*, *Campylobacter* and other enteric bacteria [27]. Meat is the main edible part of domestic mammals; however, recent definition includes species, as well as fish, shellfish, poultry and exotic species such as frogs and allegation. Similarly, meat refers to animal tissue used as food, mostly skeletal muscles and associated fat but it may also refer to organs including lungs, livers, skin, brains, bone marrow, kidney and a variety of other internal organs as well as blood. Recent increase in the consumption of meat and its products arises from reasons including high protein contents, vitamins, minerals, lipids and savory sensation [28]. In addition to pathogenic bacteria, special attention in the hygienic production and storage of chicken meat is paid also to total count of aerobic mesophilic bacteria, enterobacteria and *Escherichia coli*. These bacteria are considered indicators of microbiological quality. Total count of aerobic mesophilic bacteria in ground chicken meat is always high and consequently the risks of spoilage in the sense of microbiological disintegration are higher [28]. For fresh poultry meat, acceptable upper limits are 6.7 log<sub>10</sub> cfu/g for aerobic plate counts (APC), 4 log<sub>10</sub> cfu/g for fecal *coliforms*, 3.7 log<sub>10</sub> cfu/g for *Staph. aureus* and 2.5 log<sub>10</sub> cfu/g for *C. perfringens*. In addition, *Salmonella* and *L. monocytogenes* should be undetectable in a 25-g poultry meat sample [29]. Aerobic plate counts are a widely accepted measure of the general degree of microbial contamination and the hygienic conditions of processing plants [29]. In our study, the mean APC in broiler meat was below the value reported by Amara *et al.* (6.56 to 7.15 log<sub>10</sub> cfu/g) [30]. However, the numbers were higher than those of Oumokhtar [31], who found a mean APC value of 4.46 log<sub>10</sub> cfu/g. *Staph. aureus* is a very common organism capable of producing several enterotoxins (SEs) that cause intoxication symptoms of varying intensity in humans when ingested through contaminated food [32]. In the present study, the pathogen was isolated from 65% of poultry meat samples. The average count of *Staph. aureus* in poultry meat was below the number (5.36 log<sub>10</sub> cfu/g) reported by Amara *et al.* [30]. The reason for the high prevalence of *Staph. aureus* could have been the poor personal hygiene

Table 1: Microbial profile of broiler meat

Group	N	% of contamination	Mean	Std. Deviation	Std. Error
Total bacterial count	80	100%	5.06515	0.17855	0.13891
Staphylococcus	80	65%	4.79575	0.92024	0.145505
Clostridium perfringens	80	83%	1.2749	0.273385	0.484805
Streptococcus	80	100%	4.074	0.5104	0.406955
Salmonella	80	-	-	-	-
Coliforms	80	100%	4.038	0.82892	0.131065

of the workers and the technique used for opening the abdomen [29]. Meat and poultry carcasses and their parts are frequently contaminated with pathogens which reach the carcasses from the intestinal tract or from faecal material on feet 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. In recent years, food borne infections and intoxications have assumed significance as a health hazard. Epidemiological reports suggest that poultry meat is still the primary cause of human food poisoning. Poultry meat is more popular in the consumer market because of advantages such as easy digestibility and acceptance by the majority of people. However, the presence of pathogenic and spoilage microorganisms in poultry meat and its byproducts remains a significant concern for suppliers, consumers and public health officials worldwide [33]. In the current study, mean fecal coliform counts were higher than those reported by Oumokhtar [31], who found a mean coliform count of 2.08 log<sub>10</sub> cfu/g and were in accordance with that reported by Aymar [34] for chicken collected in the slaughterhouse at Rabat. On the other hand, the results obtained for fecal coliform counts in chickens were lower than those reported by Amara *et al.* (5.78 log<sub>10</sub> cfu/g) [30]. Contamination of poultry carcasses and parts with these organisms is well documented and data are available for many parts of the world, although inter-country comparisons are not usually possible, because of differences in sampling and methods of testing. Most *salmonella* found on poultry meat are non-host-specific and are considered capable of causing human food poisoning. *Salmonella* survive well in the environment, but *campylobacter* appear less well-adapted to survival outside the alimentary tract of warm blooded animals. Also, growth only occurs under conditions of high moisture, reduced oxygen and an environmental temperature above 30°C. The organisms are particularly sensitive to drying and the effects of freezing and thawing, which can cause a 1-2 log reduction in the level

of contamination on poultry meat [35]. In this study, the prevalence of *Salmonella* was 0%. As a cause of human food poisoning, this is not among the more dangerous pathogens. It is, however, a spore-forming organism and some strains produces spores that are unusually heat-resistant. Therefore, unlike vegetative bacterial cells, the spores are not necessarily destroyed by normal cooking and may subsequently germinate and outgrow to hazardous levels, if post-cooking storage is inadequate. *Clostridium perfringens* is one of the most widespread of all pathogenic bacteria in the environment and is commonly found (although in low numbers) in the gastrointestinal tract of healthy animals, from where it generally contaminates animal carcasses during slaughtering [36]. This result is in agreement with that reported by Wen and McClane [36], (i.e., 2%) and the contamination level is similar to those reported by Amara *et al.* [30]. *Streptococcus* (group-D) consist of *str.fecalis* and *Str.facium* and *coliforms* have very importance in food science, because in most time infection to this agents in food has been reported, therefore in recent years this bacterial as best index of fecal infection has been distinguished. Distinguish of *coliform* ratio to enterococcus is one of common methods for determine of fecal infection. For height ratio of enterococcus in animals feces and height ratio of coliforms in human feces this ratio in determine of fecal infection origin in foods have very importance [37, 38]. In present study mean of *streptococcus* was 4.074.

## CONCLUSION

The reduction of the level of human illness from food-borne pathogens is a public health goal in the many countries worldwide. As epidemiological studies show that poultry meat and eggs are important sources for consumers' exposure to zoonotic pathogens such as *Salmonella* and *Campylobacter* the reduction of the prevalence of contaminated poultry meat or eggs is a major area of focus.

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