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Research Article

Assessing the Microbiological Safety of Raw Meat sold on Different Butcher's Shop in Faisalabad, Pakistan

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Abstract

Microbial contamination and unhygienic conditions make the safety of meat questionable. The aim of this study was to check microbial quality of raw meat samples of chicken, mutton and beef, available on different butcher's shop Faisalabad. Purposely, 30 samples from each road were collected and were examined for microbial contamination. Meat samples of chicken, mutton and beef, were examined for their *Coliform, Fecal Coliform* count, *Salmonella*, and *Campylobacter* according to their standard methods. The result of present study showed that the samples collected from Satyana road and Jhang road were highly contaminated with *Coliform* (86%). The sample obtained from Jhang road and Kotwali road had highest *Salmonella* prevalence (90%) in chicken. Similarly, *Campylobacter* was highest in count at Canal road (68.1%). Sample of all type of meats were contaminated by one or more type of microorganisms. But chicken samples were contained more amount of *Salmonella, Coliform* and *Fecal Coliform* than in mutton and beef. *Campylobacter* was also prevalent in chicken at high level. Result showed that maximum contamination was occurred in chicken collected from Jhang road. Conclusively, it was observed that the microbial contamination is key source of meat spoilage and food-borne illnesses.

Keywords: Raw Meat; Safety; Contamination; Pathogen; Food Borne

Introduction

Food borne pathogens are the major sources of infections and diseases in developing countries. Unhygienic slaughter equipment's and slaughter houses are the main factors that contribute microbial contamination in raw meat [1]. Faisalabad is a large city with more than 3.204 million populations [2]. Raw meat is sold in open air local retail shops without suitable temperature control that is purchased by 50% households [3]. Meat and meat products are the most important commodities originated from cattle and poultry. They provide an ideal medium for the growth of many micro-organisms due to increased water activity, favourable pH and higher concentrations of protein, minerals and fermented carbohydrates etc. A few community based out breaks are caused by *Salmonella, E.coli, Staphylococcus aureus* and *Campylobacter* in temperature 37ºC. *Salmonella* in fresh meat especially in poultry causes food infection enteric formation [4]. *E. coli*, the presence of bacteria in meat and water is the indication of fecal pollution [5]. *Staphylococcus aureus* commonly found in the mucous membrane of nose and throat is causing the major outbreaks by the consumption of BBQ meat and poultry [6].

Campylobacters are found in reproductive organs, intestinal tract and oral cavity of human and animal. Under favorable conditions may cause diseases [7]. Carcass surface (meat) picks up this micro- organism from intestinal flora during slaughtering process. Yeast and molds play important role in meat spoilage [8]. Fungi commonly contaminates meat and its products by causing spoilage by producing mycotoxins which further damages liver and causes liver cancer and food poisoning in human [9]. Microbiological contamination of meat products were being scrutinized intensively during export/import or marketing across the boundaries. This study was conducted to investigate the microbial quality of raw meat available at different butcher's shop of different roads of Faisalabad and examined the hygienic status of meat shops and slaughter houses.

Materials and Methods

Sample collection

A total 150 samples of fresh raw meat including white and red meat were collected from five local retailer facilities located on main roads of Faisalabad city, Pakistan. A description of samples collected was presented in table 1. 25g of samples were collected from each road and obtained sample placed in sterilized plastic bags, properly labeled and transferred to the laboratory aseptically. Sample of meat were kept in ice box during transportation to avoid from contamination. Received in laboratory, immediately analyzed for *Coliform, Fecal Coliform, Salmonella* and *Campylobacter* according to their standards. Pour plate method was used for isolation and determination of bacteria from raw meat sample [10].

Area	Sample type	Sample collected
Satyana road	Mutton	10
	Beef	5
	Chicken	15
Jhang road	Mutton	10
	Beef	10
	Chicken	10
D ground	Mutton	12
	Beef	14
	Chicken	4
Kotwali road	Mutton	5
	Beef	10
	Chicken	15
Canal road	Mutton	9
	Beef	9
	Chicken	12
	Total samples	150
	Mutton	46
	Beef	48
	Chicken	56

Table 1: Sample Collection plan for meat samples.

Prevalence of Total *Coliform* and *Fecal Coliform* count

The collected samples were prepared for determination of prevalence of *Coliform*. A part of meat was cut with sterile knife. 25g of meat was put in a sterile mechanical blender and mixed with 225 mL of sterile buffered peptone water (0.1% w/v). The 10-fold serial dilutions (up to 10-6) were prepared by adding 9mL sterile saline solution and 1mL homogenized meat sample into the test tubes. The sample was incubated at 35-37ºC for 24-48 hours. 0.1mL diluted sample from each test tube and poured into petri plates containing MacConkey agar by pour plate method. The MacConkey agar plates were examined for gas and color change. Due to containing phenol red indicator and 1-5 sugar solution, the color of agar change from violet to yellow or effervescence. Most probable number (MPN) of *Coliform* was calculated on the basis of the proportion of confirmed gassing in MacConkey tubes for 3 consecutive dilutions.15 test tubes was taken having meat samples. The MacConkey broth was added in three sets of five test tubes with the help of sterile pipette, 10mL distilled water was added in first set of five test tubes,1mL distilled water in second set of five test tube and 0.1mL in third set of five test tube. Tubes were placed in an incubator at 37ºC for 24 -48 hours. Tubes showing color or volume change were observed. The results of the total *Coliform* count and *Fecal Coliform* count were expressed as the number of organism or colony forming units (CFU/g) of meat sample [10].

Prevalence of *Salmonella*

Prevalence of *Salmonella* was tested by adopting spread plate method. 25g of blended samples took in a test tubes and test tubes were numbered.10-fold serial dilutions were made, 9 mL saline solutions were added in test tubes having sample 1 mL. And then tubes were placed in autoclave at 121ºC for 15 minutes at 15 psi. And 0.1 mL sample were poured onto nutrient agar plates. The petri plates were incubated at 37ºC for 24-36 hr. Number of colonies was counted. Test was used to check the prevalence of *Salmonella* [11].

Prevalence of *Campylobacter*

25g of meat sample was blender in a stomacher machine and added sterile buffered peptone water (0.1%) about 225 mL and homogenized it. 1mL of homogenized sample was inoculated in a test tube having 9mL of distilled water. 0.1 mL Diluted sample was taken and poured into petri plates having blood agar. Sample was spread into the plates. The sample was incubated at 48ºC for 24-48 hours in an incubator. Number of colonies was counted. Test was used to check the prevalence of *Campylobacter* [12].

Results and Discussion

Most probable number (MPN) was used to observe total *Coliform* and *Fecal Coliform* count. All the observed samples were very high with total *Coliform* and *Fecal Coliform*. 10 mutton, 5 beef and 15 chicken samples were taken from Satyana road. *Coliform* and *Fecal Coliform* detected in mutton, beef and chicken was 80%, 80%, and 86% respectively. From Jhang road, 10mutton, 10beef and 10 chicken samples were brought. Observed *Coliform* and *Fecal Coliform* in mutton, beef and chicken were contaminated 70%, 80% and 90%. 12 mutton, 4 beef and 14 chicken samples were collected from the place of D-ground. And all these samples were contaminated with *Coliform* and *Fecal Coliform* 83.3%, 75% and 85% severally. 5 mutton, 15 beef, and 10 chicken samples were obtained from Kotwali road. *Coliform* examined in these samples were 60%, 66.6% and 70% respectively. 12 mutton, 9 beef and 9 chicken samples were collected from the place of canal road. *Coliform* and *Fecal Coliform* discovered in mutton, beef and chicken was 66.6%, 66.6%,and 77.7% severally [13]. The result regarding *Coliform* and *Fecal Coliform* are present in table 2. The data showed that maximum prevalence was observed in sample collected from Jhang road. The type of sample showed that chicken was contaminated more.

The prevalence of *Salmonella* in raw meat procured from popular roads of Faisalabad has been shown in table 3. The result showed that maximum prevalence was in samples collected from Jhang road and the type of sample showed that maximum contamination was occurred in chicken. Observed the most samples were contaminated with *Salmonella*. At Satyana road, chicken was contaminated with *Salmonella* about 53.3%. Mutton, beef and chicken were contaminated with *Salmonella* about 40%, 60% and 90% at Jhang road [14]. From the place of D-ground, chicken was highly contaminated. Samples collected from Kotwali road, in which beef was highly prevalent with *Salmonella*. At Canal road mutton, beef

Area	Type of Sample	No. of samples	+ ive	% Age Value
Satyana road	Mutton	10	8	80%
	Beef	5	4	80%
	Chicken	15	13	86%
Jhang road	Mutton	10	7	70%
	Beef	10	8	80%
	Chicken	10	9	90%
D-ground	Mutton	12	10	83.3%
	Beef	4	3	75%
	Chicken	14	12	85%
Kotwali road	Mutton	5	3	60%
	Beef	15	10	66.6%
	Chicken	10	7	70%
Canal road	Mutton	12	8	66.6%
	Beef	9	6	66.6%
	Chicken	9	7	77.7%

Table 2: Prevelance of *Coliform* and *Fecal Coliform* in meat sample.

Area	Type of Sample	No. of sample	+ ive	% Age value
Satyana road	Mutton	10	3	30%
	Beef	5	1	20%
	Chicken	15	8	53.3%
Jhang road	Mutton	10	4	40%
	Beef	10	6	60%
	Chicken	10	9	90%
D ground	Mutton	12	7	58.3%
	Beef	4	3	75%
	Chicken	14	11	78.5%
Ko twali road	Mutton	5	2	40%
	Beef	15	6	93.3%
	Chicken	10	5	70%
Canal road	Mutton	12	6	50%
	Beef	9	5	55.55%
	Chicken	9	6	66.6%

Table 3: Prevalence of *Salmonella* in meat samples.

and chicken was examined and chicken was prevalent with *Salmonella*. From all evaluation, chicken was highly contaminated with *Salmonella* from Jhang road [15].

Similarly, *Campylobacter* was also detected in raw meat. Results regarding *Campylobacter* are present in table 4. The data showed that maximum prevalence was observed in sample collected from canal road. Examination of those samples showed that *Campylobacter* is mostly present in chicken. At Satyana road,10 mutton samples, 5 beef samples and 15 chicken samples were brought. In which *Campylobacter* was detected in mutton, beef, chicken 60%, 60%, and 80%. Samples collected from Jhang road, 10 samples of mutton, 10 of beef and 10 of chicken were collected which observed 70% 40% and 80% *Campylobacter*. From D-ground, 12 mutton,4 beef and 14chicken samples were procured and analyzed 50%, 25% and 42% contamination. From Kotwali road samples were collected of 5 mutton, 15 beef and 10 chickens. and *Campylobacter* was examined 60%, 53% and 70% in raw meat. At canal road 12 mutton, 9 beef and9 chicken samples were collected for examined. *Campylobacter* was more observed in chicken about 88.8% [16]. The study revealed that raw meat samples were highly contaminated with several harmful microorganisms and pathogens which cause serious sickness including GIT diseases. Different studies were also carried out for analysis of raw meat and its safety standards. In one study, we have to notice that 86% raw meat is contaminated with microorganism and pathogens. In another study, similar result was obtained and96% *Coliforms* were contaminated the raw meat.

Area	Type of Sample	No. of samples	+ive	%age
Satyana road	Mutton	10	6	60%
	Beef	5	3	60%
	Chicken	15	12	80%
Jhang road	Mutton	10	7	70%
	Beef	10	4	40%
	Chicken	10	8	80%
D ground	Mutton	12	7	50%
	Beef	4	1	25%
	Chicken	14	6	42%
Kot wali road	Mutton	5	3	60%
	Beef	15	8	53.3%
	Chicken	10	7	70%
Canal road	Mutton	12	9	75%
	Beef	9	6	66.6%
	Chicken	9	8	88.8%

Table 4: Prevalence of *Campylobacter* in meat samples.

Conclusion

The existing study revealed the microbial contaminated raw meat is being sold at butcher's shops at popular roads of Faisalabad in Pakistan. The prevalence of *Salmonella* was higher as compared to others like *Campylobacter, Coliform* in raw meat. Chicken have highly microbial load than beef and mutton. It might be due to poor sanitary environment of the slaughtering place and poor personal hygiene of the workers handling the meat. It is especially important to provide training to meat handlers regarding food safety.

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