

# QUANTITATIVE AND QUALITATIVE MICROBIAL LOAD DETERMINATION FROM MEAT SAMPLES EFFECTED BY TIME AND TEMPERATURE

Pages with reference to book, From 90 To 93

Mumtaz Begum, Zafar Ali ( Biological Production Division, National Institute of Health, Islamabad. )  
Abdul Bari ( Deptment of Biological Sciences Quaid-e-Azam University, Islamabad. )

## Abstract

The effect of time and temperature on the microbial load of 300 beef samples was determined. Bacterial count were higher in the meat samples from the shops and at room temperatures. Processing under hygienic conditions, detection of carriers and storage in deepfreezers will reduce the risk of contamination (JPMA 36: 90, 1986).

## INTRODUCTION

Meat being highly nutritive, it gets easily contaminated with spoilage from pathogenic micro-organisms during slaughter and subsequent handling. The contamination of external surface often takes place during bleeding, skinning and processing. Two types of microbial contaminants can be expected i.e. micro-organisms that may produce disease and those that spoil the product and render it unfit for human consumption. The changes produced by these bacteria are proteolysis, fat hydrolysis and carbohydrate fermentation.<sup>1</sup> It is common to see that emaciated and lacerated animals with sores all over their bodies are slaughtered and sold for human consumption. Worse still is the fact that most of the animals are not disease free. Moreover during dressing and marketing hygienic conditions are not maintained. This causes a risk to human health<sup>2</sup>.

For effective sanitary control routine bacteriological examination of meat should be done in slaughter houses and retail market to provide good quality meat which is free from pathogenic organisms or substances which adversely affect the consumer's health<sup>3</sup>.

The effect of time and temperature on meat microbial load generated interest to carry out this bacteriological study, the results of which may be useful in solving problems of meat spoilage during transportation storage and upto its disposal to the consumers under the prevailing conditions.

## MATERIAL AND METHODS

**Meat Samples:** Three hundred beef samples (Cattle and buffaloes) were collected from randomly selected animals carcasses. One hundred and fifty samples were from the Sialala slaughter house (1 to 1½ hours after slaughtering) and 150 from various meat shops in Rawalpindi City. (The time between slaughtering, its transportation and marketing is 8 -9 hours).

Thirty gms of each sample, was aseptically taken in sterilized wide mouth glass stoppered bottles which were immediately transported to the Laboratory for quantitative and qualitative bacteriological analysis.

From each specimen an initial dilution of homogenate (1/100) was prepared using a clean sterilized pestle and mortar. From the homogenate further serial dilutions were prepared. One ml of the dilution containing 1/100,000 of each sample was inoculated in plate count agar petri dish. Four pairs of such inoculated plates were incubated as under: -

**A. 035-37°C for 24 hours 11: 20-25°C (Room temperature) for 24 hours Aerobically**

iii) 4-7°C (Refrigeration temperature) for 4 days

B. i) 35-37°C for 24-48 hours Anaerobically Viable aerobic counts were done by the method of Elliott et al<sup>4</sup> and anaerobic counts and isolation by the method of Dowell et al<sup>5</sup>. Coliforms were isolated by the method of Francis et al<sup>6</sup>. Attempts to isolate Salmonella were made according to the procedure described by Mildred et al<sup>7</sup>. Coagulase positive Staphylococcus were isolated on sheep. blood agar and identified by coagulase test<sup>8</sup>.

## RESULTS

Beef samples from the slaughter house and. shops had a higher mean viable aerobic bacterial counts at the room temperature than at 35-37°C and at refrigeration temperatures.

The mean viable aerobic counts/gm of beef from the shops were 69.593 x 10<sup>4</sup> at room temperature, 58.460 x 10<sup>4</sup> at 35-37°C and 37.070 x 10<sup>4</sup> at 4-7°C whereas from the slaughter house the count were 42.810 x 10<sup>4</sup> at room temperature 36.050 x 10<sup>4</sup> at 35-37°C and 24.233 x 10<sup>4</sup> at refrigeration temperature. Mean anaerobic bacterial counts/gm beef at 35-37°C were 40.407 x 10<sup>4</sup> from the meat shops and 30.487 x 10<sup>4</sup> from the slaughter house (Table 1).

Table I

Bacterial count/gm of Beef Samples from Sihala Slaughter House and the Meat Shops of Rawalpindi.

Incubation			Mean viable bacterial count/gm of beef samples from slaughter house.	Mean viable bacterial count/gm of beef samples from the meat shops.
Temperature	Time	Conditions		
A: i) 35-37°C	24 hrs	Aerobic	36.050x10 <sup>4</sup>	58.460x10 <sup>4</sup>
ii) 20-25°C (Room Temp.)			42.810x10 <sup>4</sup>	69.593x10 <sup>4</sup>
iii) 4-7°C (Refrigeration temp.)			24.233x10 <sup>4</sup>	37.070x10 <sup>4</sup>
B: i) 35-37°C	24-48 hrs	Anaerobic	30.487x10 <sup>4</sup>	40.407x10 <sup>4</sup>

In all, 1293 isolates were obtained from 300 beef samples (Table II).

**Table -II**  
**Type of Bacterial Isolates from Beef Samples of Sihala SlaughterHouse and the Meat Shops of Rawalpindi.**

Type of Isolates	150 beef samples from slaughter house		150 beef samples from the meat shops	
	No. of Isolates	Percentage	No. of isolates	Percentage
Coliforms	120	22.55	135	17.73
Pseudomonas spp.	15	2.82	105	13.80
Proteus spp.	41	7.70	80	10.51
Serratia spp.	50	9.40	65	8.55
Salmonella typhimurium	31	5.83	41	5.38
Staphylococcus aureus	25	4.70	37	4.86
Staphylococcus epidermidis	70	13.15	95	12.48
Streptococcus faecalis	60	11.28	70	9.20
Bacillus subtilis	90	16.92	95	12.48
Bacillus cereus	20	3.76	25	3.28
Clostridium perfringens	10	1.88	13	1.70

On the basis of biochemical and serological tests these isolates were identified as, Collforms (255), Pseudomonas spp . (120), Proteus spp. (121),Serratia spp (115), Salmonella typhimurium (72), Staphylococcus aureus (62), Staphylococcus epidermidis (165), Streptococcus faecalis (130), Bacillus subtiis (185), Bacillus cereus (45), Clostridium perfringens (23).

## DISCUSSION

The meat can easily be contaminated with spoilage and pathogenic microorganisms during slaughter and subsequent handling because it is nutritious and proteinacious. Irrespective of the site of collection of beef the bacterial count was high in samples incubated at room temperature (20-25°C) as compared to those incubated at 37°C and at refrigeration temperature (4-7°C)<sup>9</sup>.

Difference between mean values of viable bacterial count per gram of beef samples collected from the slaughter house and the meat shops was quite significant. Samples from meat shops showed a higher mean viable bacterial count per gram than the meat samples from slaughter house examined under the same conditions. The ambient temperature (20-25°C) and time factors may be the causes for increased number of microorganisms in case of beef samples obtained from markets.<sup>10,11</sup>

Bacterial isolate obtained were similar to those reported by others.<sup>11,12</sup> Microorganisms like proteus, pseudomonas, Escherichia coli, and Collforms are capable of producing maximum growth by consuming meat proteins and causing putrefication and hydrolysis of fat. The presence of spoilage type of microorganisms in market meat samples indicates mishandling of meat during transportation and unhygienic conditions of meat shops.<sup>13,14</sup>

The presence of Salmonella, Staphylococcus, Bacillus and Clostridium species in this study indicate contamination of beef through air, water, soil and human carriers. Toxins liberated by certain strains of Clostridium, Staphylococcus and Bacillus are highly thermostable and can survive on cooking at 100°C for many hours<sup>15</sup> Pakistani cooking systems are such that most of the prevailing organisms are destroyed and consumption of meat becomes safe. Still the persons handling the meat in raw state are likely to get the infection. Therefore, the people at risk are meat handlers in the processing plants,

butchers and house-wives who handle the meat in raw state.

For the safety of consumers and meat handlers perfect hygienic conditions should be maintained at the slaughter houses and carriers should be detected. Meat should be transported in refrigerated vans and processed hygienically at the shops and stored in deepfreezers.

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