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A STUDY ON GROUND MEAT MICROFLORA

ABSTRACT

The purpose of this study was to conduct a microbiological analysis of retail ground meat produced and marketed by butchers in Ulus district covered bazaar in Ankara city center in 2009 (in December, January, February, and June, July, August). Some members of Enterobacteriaceae family, Staphylococcus aureus, aerobe mesophyll bacteria, some molds and yeasts were identified in ground mutton and ground beef samples. We found that a number of bacteria identified in our study did not comply with Turkish Food Codex microbiological criteria. The fact that molds and yeasts identified in ground meat samples suggests that hygiene rules were not followed during the production process. Some members of Enterobacteriaceae family were found in high numbers at a level that causes risk. Staphylococcus aureus bacteria were not found.

Keywords: Ground Meat, Microflora, Ground Beef, Ground Mutton, Microbiological Risks

KIYMA MİKROFLORASI ÜZERİNE BİR ARAŞTIRMA

ÖZET

Bu çalışmada Ankara'nın Ulus semti kapalı pazarında üretim ve pazarlaması pazar içindeki kasaplar tarafından yapılan hazır kıymaların, 2009 yılının Aralık, Ocak, Şubat ve Haziran, Temmuz, Ağustos dönemlerindeki mikrobiyolojik yönden incelenmesi yapılmıştır. Koyun ve sığır etlerinden hazırlanmış kıyma örneklerinde Enterobacteriaceae, Staphylococcus aureus, aerob mezofil bakteriler ile küf ve maya mantarlarının tespiti yapılmıştır. Araştırmamızda tespit edilen bakteri sayısının Türk Gıda Kodeksi mikrobiyolojik kriterlerine uymadığı gözlenmiştir. Kıyma numunelerinde küf ve maya mantarlarının tespit edilmiş olması üretim aşamalarında hijyen kurallarına uyulmadığını düşündürmüştür. Enterobacteriaceae sayısının risk oluşturabilecek düzeyde olduğu çalışmada Staphylococcus aureus bakterisine ise rastlanmamıştır.

Anahtar Kelimeler: Kıyma, Mikroflora, Sığır Kıyması, Koyun Kıyması, Mikrobiyolojik Riskler

1. INTRODUCTION (GİRİŞ)

Mutton and beef are widely consumed in Turkey. Ground meat is obtained by stripping meat from animals with low biologic and economic value for abdomen, rib and offal's [1]. The meat's pH value and moisture content creates a favorable environment for the growth of microorganisms. It has been reported that meat undergoes a physical and chemical change by grinding, which provides an enriched growth environment for microorganisms and causes rapid spoilage [2].

Ground meat microflora is known to contain the Enterobacteriaceae family, Micrococcus genus, Rhodotorula, Oospora and Torulopsis yeasts and some molds depending on the microbial quality of meat and hygienic measures taken [3]. Ground meat contains more microorganism than pieces of meat because by grinding process contamination of ground meat is easier than contamination of pieces of meat and this process provides an enriched growth environment for microorganisms. Extended marketing and consumption time of ground meat increases the risk of the growth of microorganisms and contamination. The high number of microorganisms in ground meat causes spoilage. Pathogen bacteria and toxicological effects have serious potential threats on consumer's health [4 and 5]. Standards regarding the number of microorganisms from the production to consumption time of ground meat were determined to take measures to prevent health risks to humans. Turkish food codex enacted on 10.02.2000 sets out the duration for the handling of ground and microbial quality conditions [1].

2. RESEARCH SIGNIFICANCE (ÇALIŞMANIN ÖNEMİ)

The purpose of this study is to determine the importance of hygienic conditions and microbial quality in the production and marketing stage of ground meat and food made of ground meat which is considered as an important source of food in Turkish society.

3. MATERIALS AND METHODS (MATERYAL VE METOD)

The study used retail ground meat produced and marketed by butchers from 10 butcher's shops in the Ulus district covered bazaar in Ankara. Ten samples of 100 gr were collected from each butcher's shop at routine dates. The samples were inoculated to Staphylococcus Medium 110 Agar for Staphlococcus aureus. The inoculated mediums were incubated at 37˚C for 24 hours and at room temperature for 24 hours. The colonies which did not show mannitol, fermantation, α hemolysis and coagulase positive results were evaluated as Staphlococcus aureus negative [6]. Plate Count Agar growth medium was used to isolate aerobe mesophyll bacteria. The samples were inoculated to the Plate Count Agar using the spread plate method and were kept at 28˚C for 48 hours. The colonies that grew after this period were counted [7]. Violet Red Bile Agar growth medium was used to isolate Enterobacteriaceae. The inoculated mediums were incubated at 37˚C for 24 hours. Fermantation (+), oxidase (-) colonies were defined as Enterobacteriaceae and these bacteria were counted. Selective Wort Agar, Dextrose Agar, Potato Agar growth media were used to isolate molds and yeasts. Inoculated growth media were incubated at 28˚C for 72-120 hours. The colonies in the growth media were identified and counted [8]. The samples were collected and transferred to the laboratory following hygiene rules to prevent contamination. All procedures applied in the laboratory were carried out in aseptic conditions.

4. FINDINGS (BULGULAR)

Staphylococcus aureus, aerobe mesophyll, Enterobacteriaceae, molds and yeasts were identified and counted on ground meat samples to determine microbial quality. The effects of season and sample type on microflora were statistically determined. Numerical distribution of bacteria and fungi species identified and counted in the study are presented in Table 1. Our findings show that a number of microorganisms were lower in ground meat samples collected in December, January and February when compared to the samples collected in June, July and August. It was found that seasons had a significant effect on microflora and that ground beef had lower microorganisms load than ground mutton.

Table 1. Distribution of number of bacteria and fungi in January, February, June, July and August 2009)(CFU/g)
(Tablo 1. Aralık, Ocak, Şubat, Haziran, Temmuz ve Ağustos 2009'daki bakteri ve mantar sayısal dağılımı)

	Microorganism	Number of Sampling	Ground Meat Type		Total
			Mutton	Beef	
December, January and February	Aerobe Mesophyli Bacteria	10	4.9×10^{5}	1.3×10^{4}	50.3×10^{4}
	Enterobacteriaceae	10	3.8×10^{4}	13.2×10^{3}	51.2×10^{3}
	Staphylococcus Aureus	10	-	-	-
	Mold	10	3.4×10^{2}	5.1×10^{2}	8.5×10^{2}
	Yeast	10	15.1×10^{2}	11.8×10^{2}	26.9×10^{2}
June, July and August	Aerobe Mesophyli Bacteria	10	6.5×10^{10}	5.4×10^{10}	11.9×10^{10}
	Enterobacteriaceae	10	16.7×10^{5}	5.6×10^{5}	22.3×10^{5}
	Staphylococcus Aureus	10	-	-	-
	Mold	10	5.8×10^{3}	4.2×10^{2}	62.2×10^{2}
	Yeast	10	18.2×10^{4}	14.5×10^{4}	32.7×10^{4}

5. DISCUSSION AND CONCLUSIONS (TARTIŞMA VE SONUÇ)

Our results have shown that the number of total aerobe mesophyll bacteria did not comply with Turkish food codex microbiological criteria. According to this codex number of total aerobe mesophyll bacteria must not more than 5×10^{6} CFU/g. Total aerobe mesophyll bacteria were found to cause organoleptic chemical and microbial spoilage in ground meat starting from 10 CFU/g class value [9]. Ground meat microflora was observed to be higher in summer when compared to winter. Our results were found to be consistent with the results of Prasovska et al. [10] and Nychas et al. [11]. Detection of molds and yeasts in samples reveals that hygiene rules were not followed in the process from the production to sales. This view is supported by Weiser [12]. Some bacteria membered Enterobacteriaceae family plays an important role in food poisoning. The microbiologic quality of ground meat can be increased by shortening the period from production to consumption and implementation of strict hygiene rules. We believe that offering meat with high microbial quality to consumers and conducting frequent inspections to determine whether these meats are produced by following hygiene rules will significantly contribute to public health.

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