

The Microbiological Contamination of Traditionally Processed Raw Goose Carcasses Marketed In Kars (Turkey).

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ABSTRACT

Fourty nine geese carcasses obtained from different retail shops in Kars (Turkey) were analysed microbiologically and then results were evaluated according to Turkish Standard Regulations for fresh poultry meat. Thirty one (63.26%) out of 49 carcasses contained $\geq 5 \times 10^6$ CFU/g aerobic plate counts, and thus were beyond the safety limits. Ten (20.41%) carcasses contained ≥ 1 CFU/g *E. coli*, and 5 (10.20%) carcasses contained $\geq 5 \times 10^2$ CFU/g coagulase positive *S. aureus* and they were also beyond the safety limits. *L. monocytogenes* was detected in two of the samples. Neither *Salmonella* spp. nor *Yersinia* spp. nor *C. perfringens* was detected in any of the samples analyzed. High microbiological contamination rates have demonstrated the poor hygienic quality of geese carcasses, which in turn creates hazards for public health and food safety.

Keywords: Goose meat, microbiological quality, public health.

INTRODUCTION

While foodborne diseases remain an important public health threat worldwide, one of the most important food safety hazards is associated with raw meat and poultry products. Controlling the contamination of microorganisms to carcasses of poultry during slaughtering, processing, storage, handling and preparation is a complex challenge especially for locally and traditionally produced ones. One of the many traditional meat preparations is processed goose meat that is produced by families to meet the meat demand during winter in Kars and Erzurum region, the coldest area of Turkey. There is not a goose slaughterhouse in the region, and thus all the goose meat production are carried out at homes. Slaughtered and washed carcasses are dry salted and let to salty ripening for 15 days. After this period, carcasses are washed in fresh chilled water and hang up from legs in for drying and flavoring under sunlight in open air. After this procedure, carcasses are frozen and stocked until consumption. From early winter to early spring, at least five months in a year, processed goose carcasses are sold in local markets in this area.

The processes involved in raising and processing poultry can introduce a variety of pathogenic microorganisms from several sources. Fecal contamination of birds can occur during growth of birds at the farm, transport to the processor, or during the multiple processing steps. A processed carcass may contain pathogens on the skin that are attached by specific or nonspecific interactions,

entrapped in foods, crevices, pores (follicles) or a water-skin interface, or present within aggregates of other microbes. Thus, the detection of a potentially small number of pathogen cells on a carcass that contains much higher numbers of other microbes present a significant challenge (Mandrell and Wachtel, 1999)

Raw poultry products are perceived to be responsible for significant amount of human illness because of the relatively high frequency of contamination of poultry with *salmonella* spp. (Geornaras et al., 1995; Geilhausen et al., 1996; Uyttendaele et al., 1999; Zhao et al., 2001; Kessel et al., 2001), *enterococci* (Capita et al., 2001a; Gambarotto et al., 2001) *yeast and moulds* (Capita et al., 2001a) *E. coli* (Zhao et al., 2001), *S. aureus* (Geornaras et al., 1995; Capita et al., 2001a; Khalifa and Nassar, 2001), *C. perfringens* (Kessel et al., 2001; Khalifa and Nassar, 2001), *L. monocytogenes* (Güven and Patir, 1998; Uyttendaele et al., 1999; Capita et al., 2001b; Langiano et al., 2002) and *Y. enterocolitica* (Fukushima et al., 1987; Ramirez et al., 2000).

In a total of 487.488 tons of poultry meat, 104 tons of goose meat are presumably produced yearly in Turkey (Anonymous, 1998). A 0.2% of poultry and 6 % of goose population of total in Turkey are estimated to produce in Kars. Also, percentage of total goose meat production is a 30 % of total poultry production (Kırmızıbayrak, 2002)

We could not come across to any research investigating the presence of microorganisms on goose carcasses in Turkey. Traditional processes of

dried goose carcasses sold in Kars city appeared to be unsafe, that made us to investigate the microbiological quality of this product.

MATERIALS AND METHODS

Samples:

A total of 49 goose carcasses purchased from local retail shops in Kars (Turkey) were transferred to laboratory in sterile bags in two hours. Each carcass was left to defrost at 4 °C for 6 hours. Approximately 200 g muscle meat with skin sampled randomly from different parts of each carcass by using sterile gloves and scissors and placed into a sterile stomacher bag with 200 ml buffered peptone water, then homogenized using a stomacher (Waring, 32BL80, New Hartford, Conn. USA) at 1500 g for 2 min. A 50 g from this first homogenizate was transferred to another sterile bag and restomached with addition of 200 ml peptone water (10⁻¹ dilution), followed by tenfold serial dilutions in 0.1% sterile peptone water (Elliot et al., 1978).

Bacteriological analysis:

The spread-plate technique and a 100 µl from serial dilution was used to prepare duplicate plates for the determination of aerobic plate counts (APC), *Enterobacteriaceae* counts, and other enterococci, moulds and yeasts, coliforms, *S. aureus*, *E. coli* and *C. perfringens* counts.

APCs were determined by using the plate count agar (Oxoid, CM 463) and plates were incubated at 35 °C for 48 h. Then all colonies on plates were counted. (Harrigan and McCance, 1976; Elliot et al., 1978). Enterococci counts was made by using Slanetz and Bartley agar (Oxoid, CM 377). The plates were incubated at 35 °C for 48 h and all typical colonies (pink or dark red, with a narrow whitish border) were counted (Oxoid). For the *Enterobacteriaceae* counts, violet red bile glucose agar (Oxoid, CM 485), was used for direct plating and plates were incubated at 37 °C for 24 h. All purple colonies were counted as directed by the manufacturers. Coliform counts were determined by using onto violet red bile agar (Oxoid, CM 107) and plates incubated at 37 °C for 24 h. Typical colonies were identified as round, red to pink, 0.5-2 mm in diameter, surrounded with a red to pink halo. *E. coli* isolation procedure was carried out using EC broth and EMB agar (Harrigan and McCance, 1976; Hitchins et al., 1992). Selective enumeration of moulds and yeasts was achieved using oxytetracycline-glucose-yeast extract agar (Oxoid, CM 545) containing oxytetracycline supplement (Oxoid, SR 73). The plates were incubated at 25 °C for 5 days, and all colonies grown on plates were enumerated (Oxoid, Elliot). For the *S. aureus* counts, predried Baird-Parker agar (Oxoid, CM 275) with egg yolk-tellurite emulsion (Oxoid, SR 54) plates were used and the plates incubated at 37

°C for 24 to 48 h (Elliot et al., 1978). All typical colonies on Baird-Parker agar was counted. Selected colonies from the agar surfaces were examined under microscope for Gram stain and tested for catalase reaction, and then coagulase activity using rabbit plasma with EDTA (Merck) (Elliot et al., 1978, Bennet and Lancette, 1992; Anonymous, 1995) Isolation and enumeration of *C. perfringens* was achieved using perfringens agar (Oxoid CM 543) with supplement A (Oxoid, SR 76) and supplement B (Oxoid, SR 77) and the plates were incubated anaerobically at 35 °C for 24 h. All black colonies were assigned *C. perfringens* and other sulphite reducing clostridia.

For *Listeria* spp., a 50 g from the first homogenizate was transferred into 200 ml buffered listeria enrichment broth (Oxoid, CM 897), containing listeria selective supplement (Oxoid, SR141), and incubated at 30 °C for 48 h. The enrichment broth was then subcultured onto listeria selective agar (Oxoid, CM 856) (with listeria selective supplement (Oxoid SR 140) and incubated at 35 °C for 24 to 48 h. Typical colonies were characterized biochemically and serotyped by using commercial antisera (Difco Laboratories, Detroit,MI). (Hitchins, 1992)

For the preenrichment of *Salmonella* spp. a 50 g from the first homogenizate was transferred to a sterile erlenmayer flask with 200 ml buffered peptone water (Oxoid, CM 509) and incubated at 37 °C for 24 h. A one ml from preenrichment culture was transferred to two secondary enrichment broth (selenite cystine broth Oxoid, CM 699), with sodium biselenite and Rappaport Vassiliadis enrichment broth (Oxoid, CM 669). After a 24 h incubation period at 37 °C a combination of bismuth sulphite agar (Oxoid, CM 201), modified brilliant green agar (Oxoid, CM 329) and hectoer enteric agar (Oxoid, CM 419) was used for selective plating. Presumptive salmonella colonies selected from each of selective plate were confirmed by using API 20E identification system as described by the manufacturer (BioMerieux, Basingstoke,UK). (Harrigan and McCance, 1976; Elliot et al., 1978; Andrews et al., 1992).

For the detection of *Yersinia* spp., a 50 g from the first homogenizate was suspended in 200 ml phosphate buffered saline (Merck) with 10% peptone (Difco) and enriched at 4 °C for 21 days. After enrichment, samples were subcultured onto yersinia selective agar (Oxoid, CM 653) containing yersinia selective supplement (Oxoid, SR 109) and incubated at 32 °C for 18-24 h. The suspect colonies were selected and used for further identification according to Schiemann and Wauters (1992).

RESULTS AND DISCUSSION

The native microflora of processed poultry is composed of many types of bacteria and yeasts, which are the part of the microflora of live poultry. This microflora is carried into the processing facility on the body and in the alimentary tract of the birds. Also, processed carcasses may be picked up through cross-contamination from other broilers, water equipment and personnel inside the processing facility (Barnes, 1972; McMeekin and Thomas, 1979).

Salmonella spp., *L. monocytogenes*, *Y. enterocolitica*, *E. coli*, *S. aureus*, *C. perfringens* are accepted to be the most important food safety hazards associated with raw meat and poultry products (Bean and Griffin, 1990; Mead et al., 1999). Like other countries in the world, Turkey also has its own legislative microbiological safety criteria for foods including raw poultry meats.

The goose meat samples had an average APC value of 8.74 CFU/g. The mean APC values were more than 10^3 CFU/g in all samples examined (Table 1). According to Turkish Standard Regulation (Anonymous, 1997) for fresh poultry meat, the tolerable upper limit for APCs is 5×10^6 CFU/g, and for *S. aureus* is 5×10^2 CFU/g. In

addition, no *E. coli* is presented in 1 g of sample according to the regulation. However, we found that 31 (63.26%) out of 49 samples in this study were beyond safety limits in terms of APCs. These ranges were 10 (20.41%) for *E. coli* and 5 (10.20%) for coagulase positive *S. aureus*. In two samples, *L. monocytogenes* was also detected. Neither *Salmonella* spp. nor *Yersinia* spp. nor *C. perfringens* was detected in any of the samples analyzed. It may be implemented that locally produced meat products can be more contaminated than that of industrially produced ones. Controlled slaughter and handling processes may be helpful in solving this poor microbiological quality of goose meats in Kars-Turkey. Microbiological analysis results of goose meat samples are summarized in Table 1. We determined *Enterobacteriaceae*, Enterococci, coliforms and yeast-mould counts in samples examined. However there is no data regarding these microorganisms in the Turkish Standard Regulations and literature.

The results of this study indicates the lack of satisfactory sanitary conditions and quality control during manufacturing and/or post production handling of the goose meats, and a possible health safety problem. The results clearly indicate that attempts have to improve the sanitary conditions in traditional goose meat production procedure.

Table 1. A summary of microbiological profile of raw goose carcasses.

Counts (CFU/g)	Aerobic Plate counts		Enterococci		Coliforms		<i>Enterobacteriaceae</i>		Moulds and Yeasts		E. coli		Coagulase Positive <i>S.aureus</i>	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
< 1.0×10^2	-	-	16	34.65	22	44.92	16	32.64	8	16.32	39	79.59	44	89.79
$\geq 10^2$ to $< 10^3$	-	-	9	18.37	5	10.20	3	6.12	2	4.08	3	6.12	2	4.08
$\geq 10^3$ to $< 10^4$	1	2.04	15	30.61	5	10.20	4	8.16	2	4.08	4	8.16	1	2.04
$\geq 10^4$ to $< 10^5$	2	4.08	3	6.12	4	8.16	6	12.24	4	8.16	2	4.08	2	4.08
$\geq 10^5$ to $< 10^6$	61	2.24	6	12.24	4	8.16	3	6.12	3	6.12	1	2.04	-	-
$\geq 10^6$ to $< 10^7$	12	24.49	-	-	9	18.37	8	16.32	13	26.53	-	-	-	-
$\geq 10^7$ to $< 10^8$	10	20.41	-	-	-	-	7	14.28	10	20.41	-	-	-	-
$\geq 10^8$ to $< 10^9$	9	18.37	-	-	-	-	2	4.08	4	8.16	-	-	-	-
$\geq 10^9$ to $< 10^{10}$	9	18.37	-	-	-	-	-	-	3	6.12	-	-	-	-

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