

Sanitary status of rabbit meat EL-Dosoky, H.F.A.; Shafik, S. and Sanya, T. EL-Ghamry

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Abstract

Sixty rabbit carcasses were collected and classified as group1 consists of 30 freshly slaughtered rabbit under hygienic condition and group 2 consists of 30 chilled rabbit carcasses from different supermarkets examined for sensory character evaluation, pH values which were 5.9 ± 0.12 and 6.1 ± 0.15 for group1 and group2, respectively and microbiological examination to determine the following: Aerobic plate count, Psychrotrophic bacterial count, Enterobacteriaceae count, Most probable number of Coliforms (MPN), *Staph. aureus* count, *Pseudomonas* count and Mold count. The obtained results were 4.8 ± 1.0 , 3.5 ± 0.95 , 2.4 ± 0.75 , 2 ± 0.65 , 2.3 ± 0.8 , 3.7 ± 0.7 and 1.9 ± 0.5 log₁₀cfu/g for group1 and 5.4 ± 1.2 , 3.6 ± 0.8 , 2.7 ± 0.95 , 2.5 ± 0.60 , 2.5 ± 0.9 , 3.9 ± 0.85 and 2.1 ± 0.9 log₁₀cfu/g for group 2, respectively and with different incidences of 46.7%, 30%, 26.7%, 20% and 10% in group1 and 53.3%, 33.3%, 30%, 33.3% and 13.3% in group 2 for Enterobacteriaceae, MPN, *Staph. aureus*, *Pseudomonas sp.* and Mold, respectively. Thus, The obtained results stresses the need of frequent microbiological examination of the product to ensure its safety where the control measures and hygienic requirement needed to produce a safe and high quality rabbit meat products were discussed and clarified to be employed.

Key words: Rabbit carcasses, sensory character evaluation, pH values, Mold count.

Introduction

World production of rabbit meat was estimated to be over one million tons mostly in Europe and some Asian countries, the largest producers were China, Italy, France and Spain. Most of rabbit meat is marketed as unwrapped skinned carcasses with the thoracic viscera, liver and kidney (Anonymous1991). Rabbit with high fertility rates, fast growth and short production cycles, have good sources of meat with better nutritional and dietary properties than do red meat (Dalle Zotte, 2002 and Lebas *et al.*, 1997). Also, they added that protein content is higher while fat and cholesterol are lower. There are also difference in amino acids, certain vitamins, minerals and fat composition, where the rabbit lipids contain lower concentration of stearic and oleic acids and higher proportion of polyunsaturated fatty acids, in spite of these advantages some traditional and cultural factors partially responsible for keeping rabbit meat con-

sumption from becoming common in many countries (Parigi *et al.*, 1992; Gracey *et al.*, 1999 and Szkucik and Pyz-Lukasik, 2009). Although most researches have been dedicated to carcass composition, biological and technological factors influencing meat quality and sensory traits. In contrast, information on microbiological quality of rabbit meat is limited due to a few reports from researchers (Khallafalla, 1993; Cobanes *et al.*, 1994 and Perez-Chabela, 1999) meanwhile from the published literatures only limited microbiological data are available about rabbit carcasses because rabbit meat has not incriminated in outbreaks of food borne diseases, it is considered a safe product (DalleZotte, 2002), in spite of that the bacterial count of rabbit meat were 4.79 log₁₀cfu/gm (Bobbitt, 2003), besides food borne diseases and its importance has increased recently (EFSA, 2007), so the healthy animal may represents a reservoir of food borne pathogen through carcass contami-

nation or by cross contamination during slaughtering process (**Zweifel *et al.*, 2004**) and also by bacteria originating from animal (hides, feet and intestines), where pathogens may enter the food chain from various environmental sources during processing, even though rabbit meat have basically, the potential to carry pathogenic bacteria.

The mean of total bacterial counts at 30°C, 4.5°C (psychrotrophic count), *Pseudomonas*, Enterobacteriaceae, Coliforms, Coagulase positive *Staph. aureus* and Molds were 4.01±0.48, 3.46±0.88, 3.68±0.36, 1.79±0.91, 1.55±0.72, 0.91±0.40 and 1.91±0.28 log₁₀ cfu/g respectively for carcasses dressed at small abattoir by manual process were significantly lower ($P < 0.05$) than that in supermarkets stored at -1 to ±1°C where its mean counts were 5.87±1.03, 5.65±1.01, 6.19±0.65, 2.01±0.96, 1.43±0.56, 2.01±1.0, and 2.02±1.05 log₁₀ cfu/g respectively. Both groups of carcasses has mean pH values of 5.98 and pH 6.26±0.37 respectively (**Jose *et al.*, 2004**) in addition to (**Kohler *et al.*, 2008**) reported that the average total bacterial counts of rabbit carcasses were 3.3 log₁₀ cfu/cm², Enterobacteriaceae and Coagulase positive *Staph. aureus* were detected in (23.6% and 30.6%) carcasses, respectively with mean counts of <1.5 log₁₀ cfu /cm², for each moreover, (**Zweifel *et al.*, 2008**) added that the average total viable count on rabbit carcasses were 3.3 log₁₀ cfu/cm² and total viable count of Enterobacteriaceae and coagulase positive *Staph. aureus* ranged from 1.8-5.3 log₁₀ cfu/cm² which were detected in (23.6%) and (30.6%) respectively. (**Szkucik & Pyz-Lukasik, 2009**) could isolate coagulase-positive *Staph. aureus*, *Salmonella* and *E. coli* from rabbit meat and bacterial counts of carcass surface obtained through maintaining sanitary standards were 10³-10⁴ cfu/g, somewhat higher contamination of 10⁵-10⁶ cfu/g may occurs in slaughterhouses that do not meet sanitary standards. Because the microflora of raw meat is of interest as an index of processing practices, storage conditions, shelf life and potential risk to the public

health, so the aim of this study was therefore to assess the spread and isolation of some food borne pathogens in healthy rabbit carcasses, to obtain data on the microbial contamination of rabbit carcasses, 24 hr postmortem and at the retailing levels.

Materials and Methods

Collection of samples: A total of sixty rabbit carcasses were collected as follows; 30 rabbit were collected and slaughtered under hygienic conditions at age of two month, nearly weighting two kilograms, washed with chlorinated water for removal of external contamination then chilled at 3°C for 24 hours, named group (1) and the other 30 chilled rabbit carcasses were collected from different supermarkets named group (2).

Sensory examination: experts in sensory evaluation to evaluate rabbit meat after slaughtering and during chilling storage where changes in appearance, odor and texture were recorded and freshness quality scheme was developed according to **Costell, (2002)** and **Botta, (1995)** as follows six trained persons 30-60 years of age made assessments and the sum of points for each sample was transformed to a percentage of maximum demerit points and was expressed as the demerit score. pH values were determined by using pH meter in the biceps femoris muscles (**Ouhayoun and DalleZotte, 1996**).

Preparation of the samples for microbiological examination (APHA, 2001): Upon receipt to the laboratory 25 g each of examined samples (rabbit muscles) were homogenized with 225 ml 0.1% peptone water in a stomacher for 2.5 minutes at 3000 rpm and filtered through a sterile cheese cloth filter, followed by ten fold six serial dilutions in 0.1% peptone water to determine:

A-Aerobic plate count according to **APHA, (2001)**.

B-Psychrotrophic bacterial count according to **ISO7932, (2004)**.

C-Enterobacteriaceae count according to **APHA, (2001)**.

D-Most probable number of Coliforms (MPN) according to **FDA(2005)**.

E-*Staph. aureus* count according to **APHA, (2001)**.

F-Detection of *Pseudomonas sp.* count according to **Oxoid, (1986)**.

G-Mold count according to **Harrigan, (1998)**.

Results and Discussion:

Table(1). Sensory quality evaluation of rabbit meat.

Parameter	Characteristic	Demerit points
Color	Characteristic rabbit meat color	0
	opaque	1
	yellowish	2
Odor (fresh)	Normal	0
	Neutral	1
	Trace off odor	2
Odor (boiled)	Normal	0
	Neutral	1
	Abnormal, urine	2
Flesh texture	Firm	0
	Slightly soft	1
	Soft	2
Wetness	Normal	0
	Slightly dry or slightly wet	1
	Moderately dry or moderately wet	2
Contamination (hair, feces, blood patches)	None	0
	Slight	1
	Moderate	2
Fat appearance	White	0
	Opaque	1
	Yellowish	2
Rancidity (odor)	Absent	0
	Sight	1
	Moderate	2
Package	Normal	0
	Defective	1
	broken	2
Maximum demerit points for group (1)&(2)		17&19

Table (2). Sensory and pH evaluation of the examined rabbit meat

Groups	Demerit score (%)	pH
Group (1)	9.7±2.8	5.9 ±0.12
Group (2)	15.4±2.05	6.1 ±0.15

Demerit score % =total Demerit points transformed to a mean ± SE percentage of maximum demerit points attainable

Table (3). Microbiological mean counts of rabbit meat (expressed as log₁₀/g).

Microorganisms Groups	No.	APC	Psychrotrophic	Enterobacteriaceae	MPN	<i>Staph. aureus</i>	<i>Pseudomonas</i>	Mold
Group (1)	30	4.8±1.0	3.5±0.95	2.4±0.75	2±0.65	2.3±0.8	3.7±0.7	1.9±0.5
Group (2)	30	5.4±1.2	3.6 ±0.8	2.7±0.95	2.5±0.6	2.5±0.9	3.9±0.85	2.1±0.9

NB: No =Number of examined samples; APC=Aerobic plate count (mean ±SE log₁₀ CFU/gm); MPN= Most probable number of coliforms; group (1) = Freshly slaughtered rabbit; group (2)= Chilled rabbit carcasses. and SE= standard error

Table (4). Incidence of positive microbial counts in the examined samples

Microorganisms Groups	Samples number	Enterobacteriaceae		MPN		<i>Staph. aureus</i>		<i>Pseudomonas</i>		Mold	
		No	%	No	%	No	%	No	%	No	%
Group (1)	30	14	46.7	9	30	8	26.7	6	20	3	10
Group (2)	30	16	53.3	10	33.3	9	30	10	33.3	4	13.3

Although dressing of each meat species should be regarded as a unique process, dressing of rabbit has been compared with that of beef carcasses. Hence, Evaluation of freshness and potential consumer acceptance defined in terms of carcass characteristics such as appearance, color, odor and texture which were one of the principal aims of this study, Therefore, the sensory quality of rabbit meat was determined on the basis of quality grading assessment **Costell, (2002)** to which demerit points ranging from 0 to 3 table (1), the lower score the better quality, in this study demerit points significantly differentiate group 1 from group 2 as in table (2).

In rabbit the final pH reached within 20 hr. after slaughtering with value depending on the muscle evaluation (**Hulot and Ouhayoun, 1999**). This variation in pH could be a factor influencing the types of microorganisms growing on rabbit meat where the results of pH in table (2) slightly lower than that recorded by **Jose, et al. (2004)**.

As with other raw meat, rabbit has a potential to carry food poisoning organisms derived from different sources (rabbit skin, gut contents, feces, abattoir environment, workers, cutting and packaging process besides handling at the retail levels). Rabbit carcasses are obtained, processed and stored like other meat and the postmortum biochemical changes that

occur to rabbit meat are similar to that occur to red meat and poultry, therefore spoilage will essentially the same as in other chilled meat as a result of microbial action **Hulot and Ouhayoun, (1999)**. The results of APC in table (3) were 4.8±1.0 and 5.4±1.2 log₁₀ cfu/g for group1 and group2 respectively, which were identical to that found by **Khallafalla, (1993)**; **Bobbitt, (2003)**; **Jose et al., (2004)**; **Zweifel et al., (2008)** and **Szkucik & Pyz-Lukasik, (2009)**, there was a significant difference (P<0.05) in APC between group1 (fresh) and group 2 (chilled) rabbit carcasses.

In case of psychrotrophic bacterial count, table (3) shows that the counts were 3.5±0.95 and 3.6 ±0.8 log₁₀cfu/g for group1 and group 2 respectively, where the results were significantly (P<0.05) lower in group1 (fresh) than group2 (chilled) rabbit carcasses and nearly in approach with the results of **Jose et al., (2004)**.

Although storage for 24hr at 3⁰c results in some microbial proliferation where the log mean of Enterobacteriaceae table (3) were 2.4±0.75 and 2.7±0.95 log₁₀cfu/g for group1 and group 2 respectively, which agree with **Khallafalla,(1993)**; **Jose, et al., (2004)**; **Zweifel et al., (2008)** and **Szkucik & Pyz-Lukasik, (2009)** with incidence rate of 46.7% and 53.3% respectively the results were significantly lower (P<0.05), in group1 than group2

of rabbit carcasses meanwhile, the MPN of coliforms considered as indicator of possible hazardous contamination (Gill, 2000), the mean MPN of coliforms count table (3) were 2 ± 0.65 and 2.5 ± 0.60 $\log_{10}$ cfu/g which were significantly lower ($P < 0.05$) in group 1 than group 2 of rabbit carcasses and similar to Mackey and Roberts, (1993); Khallafalla, (1993); Gill *et al.*, (1998); Jose, *et al.* (2004) and Szkucik & Pyz-Lukasik (2009) with incidence rate of 30.% and 33.3% respectively.

Staph. aureus can cause a number of diseases in rabbit, the most relevant of which are abscesses and mastitis and present in rabbit carcasses by counts of 2.3 ± 0.8 and 2.5 ± 0.9 $\log_{10}$ cfu/g, the results were significantly lower ($P < 0.05$) in group 1 than group 2 of rabbit carcasses with incidence rate of 26.7% and 30% tables (3, 4) respectively, these results were achieved also by Lebas, *et al.* (1997); Perez-Chabela *et al.*, (1999); Rosell, (2000); Jose *et al.*, (2004); Zweifel *et al.*, (2008) and Szkucik & Pyz-Lukasik, (2009).

Pseudomonas was one of the main microbial contamination that observed 24hr after rabbit slaughtering, usually was dominant on chilled stored under aerobic conditions. The counts of isolated *Pseudomonas* in tables (3,4) were 3.7 ± 0.7 and 3.9 ± 0.85 $\log_{10}$ cfu/g and significantly lower ($P < 0.05$) in group 1 than group 2 of rabbit carcasses with incidence rate of 20% and 33.3% respectively, which were in accordance with Khallafalla, (1993); Bobbitt, (2002) & (2003) and Jose *et al.*, (2004).

Psychrotrophic molds are unable to compete bacteria because of their slower growth rates. However in some surveys of raw poultry the mean initial population of molds were similar to those found in this study and increased up to 5 log during refrigerated storage (Geornaras, *et al.*, 1994 and Ismail *et al.*, 2000). The total count of mold were 1.9 ± 0.5 and 2.1 ± 0.9 $\log_{10}$ cfu/g which were significantly lower ($P < 0.05$) in group 1 than group 2 of rabbit carcasses with incidence rate of 10% and 13.3% respectively these results nearly in accordance with Jose *et al.*, (2004).

Conclusion

From the results obtained in this study and its compatibility with other researches in the same domain, it can be concluded that difference in microbial count and incidence of positive samples expressed by measuring F test (one way anova) was significant, otherwise Group 1 were less contaminated than Group 2 hence, maintenance of hygiene during slaughtering of rabbits may be achieved by regular slaughtering process analysis and microbiological verification of the environment and carcasses in accordance with HACCP.

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الحالة الصحية للحوم الارانب

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الملخص العربي

اشتملت هذه الدراسة على عدد ٦٠ ارنب نصفها تم ذبحه بطريقة يدوية وتجفيفها وغسلها بالماء ثم تركها في ماء بارد (٣م°) لمدة ٢٤ ساعة قبل الفحص والنصف الاخر تم تجميعه من محلات السوبرماركت المختلفة التي تباع لحوم الارانب المبردة حيث تم اخذ هذه الذبائح للفحص الحسي ومعرفة درجة الحموضة وعزل بعض الميكروبات الممرضة بها حيث تم تحديد العد الكلى للبكتيريا الهوائية والبكتيريا المحبة للبرودة وعد البكتيريا المعوية وعد الكوليفورم والعد الكلى لميكروب الاستافيلوكوكس اوريس وعزل ميكروب السيدوموناس والفطريات فكانت كالتالي:

١٠، بينما كان معدل تواجد المجموعة الثانية على الترتيب كالتالى ٣،٥٣، ٣،٣٣، ٣٠، ٣،٣٣، ٣، ١٣% . ويوصى بالفحص الدورى للحوم الارانب سواء الطازجة او المبردة ومحاولة الاقلال من تلوثها اثناء الذبح والاعداد والحفظ .