

BACTERIAL PROFILE OF RETAIL RABBIT CARCASSES MARKETED IN BENI-SUEF PROVINCE, EGYPT

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ABSTRACT

The current study aimed to evaluate the bacteriological status of retail rabbit carcasses marketed in Beni-Suef province, Egypt. For such aim, a total of 25 fresh rabbit carcasses were randomly collected from different rabbit markets in Beni-Suef during 2015. The collected samples were subjected to determination of aerobic plate count (APC) at 35 °C, and most probable number (MPN) of coliforms, faecal coliforms and *E. coli*, in addition to isolation and identification of *E. coli* (true faecal type), *Salmonella* spp. and *Yersinia enterocolitica*. The obtained results revealed that 32, 64, 72 and 52 % of examined rabbit meat samples from shoulder, loin, rib and thigh regions, respectively, exceeded the acceptable limits recommended by Egyptian standards for APC (10^5 CFU/g flesh). While none of the examined samples exceeded the international standards (10^7 CFU/g) stated by the International Commission on Microbiological Specification for Foods (ICMSF). Regarding the pathogenic microorganisms, it was found that 11 (44 %), 8 (32 %), 15 (60 %) and 10 (40 %) out of 25 rabbit cuts contained *E. coli* biotype I in shoulder, loin, rib and thigh regions, respectively. However, 3 (12%), 3 (12%), 3 (12%) and 2 (8%) samples contained *Salmonella* spp., and 3 (12%), 3 (12%), 6 (24%) and 7 (28%) contained *Yersinia enterocolitica*, respectively. The public health significance of isolated pathogens and their sources of contamination were discussed throughout the study.

Key words: Rabbit meat, Bacterial profile, *E.coli*, *Salmonella*, *Yersinia enterocolitica*.

INTRODUCTION

Rabbit meat is a highly desirable food, which represents a good source of animal protein of a high biological value. It contains all essential amino acids required for human nutrition as well as a higher proportion of unsaturated fatty acids and less cholesterol than other kinds of animal meats (Gergis, 2004). Rabbit meat has a highly palatable and digestible quality for consumers all over the world, and can be used as a subsidiary animal food due to their short generation interval, high fecundity and rabbit growth rate. Rabbit meat consumption is mainly developed in Mediterranean countries of the EU. It is considered by the traditional consumer to have positive sensory properties such as tenderness, low fat and delicately flavored, although a main cause of refusal is its typical wild taste (Dalle Zotte, 2002).

Bacteriological contamination is one of the main risk conditions that affects meat quality (including rabbit) and public health such as; *Salmonella* spp., *Yersinia enterocolitica*, *Escherichia coli*, which are

object of public health certification because of the potential risks they represent in diseases transmitted by food (Plym and Wierup, 2006). Each processing stage during rabbit meat preparation, from farm to fork, will add microbial contaminants to the initial bacteria count and thus decrease the keeping quality of the meat. Determination of the numbers and types of microorganisms contaminating the animal carcass is vital, from the standpoint of public health, for judging the effectiveness of sanitary measures during processing, and for estimating the quality characteristics including shelf-life (Buttler *et al.*, 1979).

Salmonellae, *E. coli* and *Yersinia enterocolitica* are considered as three of the most common food-borne pathogens in developing countries as well as in developed ones, although their incidence varies from one country to another (Henson, 2003).

The microbiological quality of rabbit carcasses and changes during processing have not been studied in such depth as for other meats, accordingly, information on the microbiological quality of rabbit meats in Egypt is scarcely found (Abou-Taleb, 1995; Ali *et al.*, 2015 and Khalafalla, 1993). Therefore, the current study was designed in order to evaluate the bacterial profile of rabbit carcasses marketed in Beni-

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Suef province through the determination of the aerobic plate count (APC) at 35 °C, and most probable number (MPN) of coliforms, faecal coliforms and *E. coli*. In addition to the isolation and identification of *E. coli* biotype I, *Salmonella* and *Yersinia enterocolitica*.

MATERIALS AND METHODS

1. Collection of the samples:

A total of 25 fresh rabbit carcasses of native breeds were randomly collected from different rabbit markets at Beni-Suef province; the rabbits were slaughtered, dressed, eviscerated at the same day of collection at the markets by the markets' workers. Three rabbits were collected weekly and all of the collected rabbits were apparently sound at the time of collection. Then the rabbit carcasses were identified and wrapped in a sterile polyethylene bags and directly transferred in an icebox with a minimum of delay to the laboratory for further preparation and examination.

2. Preparation of the samples:

Preparation of the meat sample was carried out according to the muscle maceration technique recommended by AOAC (1990). Briefly; by using sterile instruments, 25 g of rabbit meat were aseptically removed from the deep tissues after surface sterilization using hot spatula of each rabbit primal cut; shoulder, rib, loin and thigh regions, according to Aduku and Olukosi (1990), then transferred into sterile homogenizer flask containing 225 ml of 0.1 % sterile buffered peptone water (Biolife; Italy). The contents were homogenized at 2000 r.p.m. for 2.5 min using sterile homogenizer (MPW 302, Universal Laboratory Aid, made in Poland). The homogenate was allowed to stand for about 15 min at room temperature. The contents of the flask represent the dilution 10^{-1} were thoroughly mixed by shaking, one ml was aseptically transferred using a sterile pipette into sterile test tube containing 9 ml of 0.1 % sterile buffered peptone water to be diluted in a sequential manner by tenfold serial dilution up to 10^{-6} .

3. Bacteriological examination:

3.1. Determination of APC at 35 °C:

The pouring plate technique recommended by AOAC (1990) was applied. Briefly, one ml from each dilution was separately pipetted into a double set of sterile Petri dishes. 15 ml of melted standard plate count agar (Biolife; Italy) tempered at 45 °C were poured into each Petri dish, then thoroughly mixed and left to solidify. The inoculated plates were incubated in an inverted position at 35 °C for 48 ± 2 hours. The plates that contain colonies between 30 and 300 were counted, and then the average count was multiplied by the dilution factor to get APC/g according to the following formula:

$$\text{APC /g} = \text{Average number of colonies} \times \text{dilution factor.}$$

3.2. MPN of Coliforms, Faecal coliforms and *E. coli*:

The three tubes MPN method recommended by AOAC (1990) was used. In brief, regarding the MPN of coliforms, Lauryl Sulphate Tryptose broth (LST) with inverted Durham's tube was used for presumptive coliforms count followed by a confirmatory step through using sterile test tubes containing Brilliant Green Bile Lactose broth (BGBL) with inverted Durham's tube for positive LST tubes. For faecal coliforms MPN, sterile test tubes containing *E. coli* broth (EC) with inverted Durham's tube were incubated at 44 ± 0.5 °C. While for *E. coli* MPN, a loopful from each positive EC broth tube was streaked onto the surface of Eosin Methylene Blue agar plate. The plates showing typical *E. coli* colonies (greenish metallic nucleated with dark purple center with or without sheen) were recorded. The MPN of each of coliforms, faecal coliforms and *E. coli* per g of rabbit meat was estimated according to the three tubes MPN table using the following equation:

$$\text{MPN/g} = \text{Number from the table} \times \text{middle dilution factor}/100$$

3.4. Isolation and identification of *E. coli* biotype I:

Suspected colonies of *E. coli* were subjected for further identification according to the method reported by AOAC (1990). Concisely, a stained smear with Gram's stain was prepared from a separate colony to be examined microscopically. Then the suspected colonies were biochemically identified using indole production (I), methyl red (M), voges proskauer (Vi) and citrate utilization (C) tests. Where the samples gave *E. coli* specific IMViC pattern (+ - + -) were considered as *E. coli* biotype I.

3.5. *Yersinia enterocolitica*:

For determination of *Yersinia enterocolitica*, the technique recommended by APHA (1992) was done as follows:

3.5.1. Isolation of *Yersinia* spp.:

a) Selective enrichment:

One ml of the previously prepared original homogenate was inoculated into a test tube contained 9 ml of Modified Rappaport Vassilidis broth (Biolife; Italy), which then thoroughly mixed and incubated at 25 °C for 3 days.

b) Selective differential plating:

A loopful of cold enrichment broth was streaked onto *Yersinia* selective agar base (CIN, Biolife; Italy) to which *Yersinia* selective supplement (Biolife; Italy) was added. The inoculated plates were incubated at 32 °C for 18 hrs. Suspected colonies (dark red "bull's

eye" colonies surrounded by transparent border) were picked up onto a Nutrient agar slope for further identification.

3.5.2. Identification of the isolates:

A separate colony on Nutrient agar plate from each isolate was used for preparation of Gram's stained smear for Microscopical identification. Then the biochemical identification of the suspected colonies was applied according the following procedures: to differentiate the genus *Yersinia* from other genera; motility test at 37 °C, gas production from glucose fermentation, citrate utilization at 37 °C, voges proskauer at 25 °C and H₂S production tests were done. Where isolates showing negative results with all pervious experiments were considered as *Yersinia* spp. While, *Yersinia enterocolitica* samples were identified from other *Yersinia* spp. using motility test at 25 °C, citrate utilization at 25 °C, urease and rhamnose fermentation tests. The samples that gave positive results with the first three experiments and failed to produce acid with the last one were considered as *Yersinia enterocolitica*.

3.6. Isolation of *Salmonella* spp.:

Isolation of *Salmonella* spp. from rabbit meat samples was carried out as reported in the ISO 6579:2002 protocol with slight modifications. Briefly, the previously prepared original dilution (10⁻¹) was incubated at 37°C for 20-24 h as a pre-enrichment step. After that, 0.1 ml of the cultured original dilution was inoculated into a tube containing 10 ml sterile Rappaport Vassilidis soy broth (Biolife; Italy) for selective enrichment and further incubated at 41.5 ± 0.5 °C for 24 h. A loopful from incubated broth was streaked onto two selective plating media, which were brilliant green agar (BGA) and Xylose Lysine Desoxycholate agar (XLD). All the inoculated plates were incubated at 36 ± 1 °C for 24 h. Moderately large, moist, smooth, and colorless colonies with pink background on BGA and slightly transparent red colonies with black center on XLD agar were

suspected as *Salmonella*. The characteristic colonies of *Salmonella* were further streaked on nutrient agar plates and incubated at 36 ± 1 °C for 24 h for purification, and then on nutrient agar slopes for further identification and biochemical characterization. The initial identification step was done using Gram's stain smears and oxidase test, all isolates showing Gram's stain positive and/or oxidase positive were discarded. Then other isolates were biochemically tested using indole, methyl red, voges proskauer, citrate utilization, triple sugar iron (TSI), and urease tests as per the protocol described by Ewing (1986). The colonies showing *Salmonella* specific IMViC pattern (- + - +) were further inoculated on TSI slants and colonies produced alkaline slant (pink) and acidic butt (yellow) with or without H₂S production (blackening) were tested for urea hydrolysis on urea agar slants. All the urease negative isolates were considered as biochemically confirmed *Salmonella* isolates.

4. Statistical analysis:

Data were subjected to analysis of variances (one way-ANOVA) according to Knapp and Miller (1992) using (SPSS Statistics 17.0) software program.

RESULTS

The results presented in Table (1) showed the APC in different primal cuts of examined rabbit meat samples. It was found that it ranged from 5.1×10³ to 8.8×10⁶, 3.9×10³ to 9.3×10⁶, 2.6×10³ to 9.3×10⁶ and 5.1×10³ to 4.0×10⁶, with mean values accounted for 1.5×10⁶, 1.1×10⁶, 1.2×10⁶ and 5.7×10⁵ CFU/g flesh in shoulder, loin, rib and thigh regions, respectively. Slightly higher results were recorded by Abou-Taleb (1995) and Hohn (1960), while approximately similar values were obtained by Shiffman (1961) and Sunki *et al.* (1978), and lower values were reported by Comin *et al.* (2008) and Khalafalla (1993).

Table 1: Statistical analytical results of APC at 35 °C in different cuts of examined rabbit carcasses (CFU/g) (n=25).

Carcass cuts	Positive Samples		Minimum	Maximum	Mean	Standard error
	No.	%				
Shoulder	25	100	5.1×10 ³	8.8×10 ⁶	1.5×10 ⁶	5.1×10 ⁵
Loin	25	100	3.9×10 ³	9.3×10 ⁶	1.1×10 ⁶	4.3×10 ⁵
Rib	25	100	2.6×10 ³	9.3×10 ⁶	1.2×10 ⁶	4.4×10 ⁵
Thigh	25	100	5.1×10 ³	4.0×10 ⁶	5.7×10 ⁵	2.0×10 ⁵

From the data illustrated in Table (2), it could be concluded that the MPN of coliforms in examined rabbit meat samples ranged from <3 to 1.5×10⁴, <3 to 9.3×10³, <3 to 1.5×10⁴ and 7.4 to 9.3×10³, with mean values of 2.0×10³, 1.2×10³, 1.7×10³ and 1.7×10³

microorganisms/g meat in shoulder, loin, rib and thigh regions, respectively. Higher results of Coliforms (MPN) were detected by Abou-Taleb (1995) and Kpodékon *et al.* (2008), and lower results were obtained by Margüenda *et al.* (2012).

Table 2: Statistical analytical results of coliforms MPN in different cuts of examined rabbit carcasses (microorganisms/g) (n=25).

Carcass cuts	Positive Samples		Minimum	Maximum	Mean	Standard error
	No.	%				
Shoulder	23	92	<3	1.5×10^4	2.0×10^3	7.3×10^2
Loin	24	96	<3	9.3×10^3	1.2×10^3	4.2×10^2
Rib	24	96	<3	1.5×10^4	1.7×10^3	7.5×10^2
Thigh	25	100	7.4	9.3×10^3	1.7×10^3	4.1×10^2

The aforementioned results in Table (3) outlined the MPN of faecal coliforms in different primal cuts of examined rabbit meat samples. The faecal coliforms MPN values ranged from <3 to 2.3×10^3 , <3 to

4.3×10^3 , <3 to 4.3×10^3 and <3 to 4.3×10^3 , and the mean values accounted for 2.9×10^2 , 6.6×10^2 , 5.5×10^2 and 1×10^3 microorganisms/g meat in shoulder, loin, rib and thigh regions, respectively.

Table 3: Statistical analytical results of faecal coliforms MPN in different cuts of examined rabbit carcasses (microorganisms/g) (n=25).

Carcass cuts	Positive Samples		Minimum	Maximum	Mean	Standard error
	No.	%				
Shoulder	23	92	<3*	2.3×10^3	2.9×10^2	1.1×10^2
Loin	23	92	<3*	4.3×10^3	6.6×10^2	2.6×10^2
Rib	24	96	<3*	4.3×10^3	5.5×10^2	2.4×10^2
Thigh	23	92	<3*	4.3×10^3	1×10^3	2.6×10^2

* < 3=0

Concerning the MPN of *E. coli* illustrated in Table (4), it was observed that it ranged from <3 to 7.4×10^2 , <3 to 2.3×10^3 , <3 to 2.3×10^3 and <3 to 2.3×10^3 microorganisms/g meat in shoulder, loin, rib and

thigh regions, respectively. While the mean values were 8.7×10 , 2.5×10^2 , 2.4×10^2 and 4.2×10^2 microorganisms/g meat, respectively.

Table 4: Statistical analytical results of *E. coli* MPN in different cuts of examined rabbit carcasses (microorganisms/g) (n=25).

Carcass cuts	Positive Samples		Minimum	Maximum	Mean	Standard error
	No.	%				
Shoulder	21	84	<3*	7.4×10^2	8.7×10	3.6×10
Loin	20	80	<3*	2.3×10^3	2.5×10^2	1.1×10^2
Rib	23	92	<3*	2.3×10^3	2.4×10^2	1.2×10^2
Thigh	22	88	<3*	2.3×10^3	4.2×10^2	1.0×10^2

* < 3=0

As regard to the incidence of isolated pathogens from examined rabbit carcasses, the illustrated data in Table (5) and Figure (1) showed that 11 (44 %), 8 (32 %), 15 (60 %) and 10 (40 %) out of 25 rabbit cuts contained *E. coli* biotype I in shoulder, loin, rib and thigh regions, respectively.

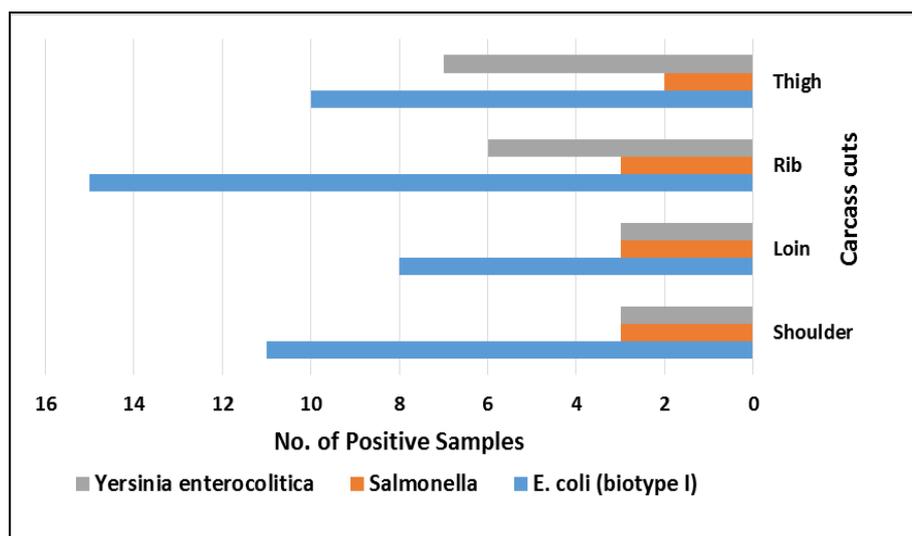
Besides, the same table and figure revealed that 3 (12%), 3 (12%), 3 (12%) and 2 (8%) out of 25 rabbit

meat samples contained *Salmonella* spp. in shoulder, loin, rib and thigh regions, respectively.

Furthermore, it could be clarified from Table (5) and Figure (1) that 3 (12%), 3 (12%), 6 (24%) and 7 (28%) out of 25 rabbit cuts contained *Yersinia enterocolitica* in shoulder, loin, rib and thigh regions, respectively.

Table 5: Incidence of isolated pathogens from examined rabbit carcasses (n=25).

Pathogens	Shoulder region		Loin region		Rib region		Thigh region	
	No.	%	No.	%	No.	%	No.	%
<i>E. coli</i> (biotype I)	11	44	8	32	15	60	10	40
<i>Salmonella</i> spp.	3	12	3	12	3	12	2	8
<i>Yersinia enterocolitica</i>	3	12	3	12	6	24	7	28

**Figure 1:** Incidence of isolated pathogens from examined rabbit primal cuts (n=25)

DISCUSSION

1. Bacteriological counts of examined rabbit primal cuts:

1.1. APC at 35 °C:

The high levels of aerobic plate counts found in the present study could be attributed to the bad hygienic measures observed during slaughtering, preparation and handling of carcasses at retail markets. These findings held the view reported by Finzi and Costa (1979) that equipment, air, water and workers are vehicles of microbial contamination of food. So that slaughtered rabbit carcasses generally have low bacterial count when slaughtered under high sanitary conditions, while during handling and processing the number of microorganisms increased significantly. Moreover, these reports are in accordance with the conclusion of Khalafalla (1993) that slaughtered rabbit carcasses from the groceries stores have higher bacterial counts than home slaughtered.

As regard to the permissible limits, it was obtained that 8, 16, 18 and 13 out of 25 samples of examined rabbit meat samples from shoulder, loin, rib and thigh regions representing 32, 64, 72 and 52 %, respectively, exceeded the maximum acceptable limits recommended by ES (2005) for aerobic plate

count in chicken and rabbits (10^5 CFU/g flesh). Comparatively with the acceptability limit of aerobic plate count (10^7 CFU/g flesh) stated by ICMSF (1986), it was found that none of the examined rabbit carcasses exceeded such level. In this respect, Özogul *et al.* (2004) stated when the aerobic plate count reaches 10^6 CFU/g or ml in a food product, it is assumed to be at, or near, spoilage. On the other hand, Zambuchini *et al.* (2008) reported that standards, guidelines and specifications often use much lower bacterial population or total plate count as indices of acceptability.

From the present data, it could be concluded that unhygienic handling of rabbits during slaughtering, dressing, evisceration, storage and marketing is the main cause of higher total bacterial population.

1.2. Coliforms MPN:

Coliform group of bacteria in meat has been considered important in microbiological analysis on account of their significance as indicator organisms for pin painting the unhygienic conditions during handling and processing. Therefore, presence of coliforms in rabbit meat may be responsible for their inferior quality resulting in economic losses besides their presence in a great number may raise the public health risk (Mercuri and Cox, 1976; National

Academy of Science, 1985). In conclusion, presence of coliforms in some of the examined rabbit carcasses in the current study could be attributed to the unhygienic and faulty methods of evisceration, preparation and handling, which were noticed during collection of the samples, these results run with that published by Libby (1975) and Miskimin *et al.* (1976).

1.3. Faecal coliforms MPN:

Lower values of faecal coliforms (MPN) in rabbit meat than those reported in the current study was determined by Abou-Taleb (1995). Presence of faecal coliforms in the examined rabbit carcasses in the present study is an indicative of faecal contamination and could be attributed to the faulty evisceration and/or the lack of proper personnel hygiene of workers. Such findings coincide with that obtained by Gonzalez-Rodriguez *et al.* (2001) and Youssef *et al.* (1985) that the presence of faecal coliforms in food is indicative of faecal contamination.

1.4. *E. coli* MPN:

Lower values of *E. coli* (MPN) than reported in the present study were demonstrated by Abou-Taleb (1995); Khalafalla (1993) and Velázquez *et al.* (2008). In this respect, Brown and Baird-Parker (1982) suggested that the analysis of foods of animal origin for the presence or levels of *E. coli* has been widely accepted as an indicator for fecal contamination. Moreover, the presence of such organism indicated the possibility of occurrence of microbiological hazards. Accordingly, these findings confirm the faecal contamination of examined rabbit carcasses during preparation.

2. Incidence of studied pathogens in examined rabbit carcasses:

2.1. *Escherichia coli* (biotype I):

The obtained incidences of *E. coli* biotype I indicate that positive samples are not acceptable according to the standards of *E. coli* in rabbit meat recommended by ES (2005) which stated that rabbit meat must be free from *E. coli*. Lower incidences of *E. coli* biotype I were obtained by Abou-Taleb (1995); Khalafalla (1993) and Velázquez *et al.* (2008). While Rodríguez-Calleja *et al.* (2006) could not isolate it from rabbit carcasses.

E. coli is an emerging cause of food borne illness and now is recognized as an important human pathogen, it is a ubiquitous commensal of the gastrointestinal tract where it presents in large numbers (Pennington, 1997). The isolation of biotype I *E. coli* from food samples is of a significant public health importance as consumption of such contaminated food may result in infantile diarrhea and gastroenteritis in adults (Sapna-Kumari *et al.*, 2001). From the present study, it could be concluded that the isolation of biotype *E. coli* from

the examined rabbit meat samples is an indicator of the existence of public health risks to consumers.

2.2. *Salmonella* spp.:

The detection of *Salmonella* spp. in some rabbit carcasses indicates that such samples are not acceptable according to the standard of *Salmonellae* in rabbit meat recommended by ES (2005) which has not set an acceptable limit for *Salmonella* spp. in rabbit carcasses. Almost similar results were reported by Khalafalla (1993). However, lower results were obtained by Comin *et al.* (2008) and Velázquez *et al.* (2008). While, Kpodékon *et al.* (2008) could not isolate *Salmonellae* from examined rabbit carcasses.

The source of contamination of slaughtered rabbit carcasses by *Salmonella* spp. could be due to bad personnel hygiene and/or unsanitary measures during carcass preparation; this held the view of Molla *et al.* (2003) who isolated *Salmonellae* from slaughtered animals with a percentage of 4.2 % and from slaughterhouse personnel with a percentage of 6.0 %. Furthermore, these results are parallel to that reported by Samuel *et al.* (1980) that the leading source of contamination of carcasses by *Salmonellae* is the fault evisceration at the slaughterhouse. Regarding the public health significance of *Salmonella* spp., it was reported that *Salmonella* is the primary cause of food poisoning in Canada. It caused about 68 % of microbial related food poisoning outbreaks (Lavigne, 1986). Furthermore, Plym and Wierup (2006) mentioned that non-typhoid salmonellosis in humans manifested as a localized enterocolitis, clinical signs usually begin 12 to 36 h after ingestion of a contaminated food, include diarrhea, nausea, abdominal pain, mild fever and chills.

2.3. *Yersinia enterocolitica*:

Yersinia enterocolitica is a psychrotrophic organism, which was associated with a variety of human illnesses, of which enterocolitis is the most frequent manifestation. The organism has become of a considerable public health significance, several outbreaks of foodborne infection caused by consumption of contaminated food by this organism (De-Boer *et al.*, 1986).

Nearly similar results to those of our study were detected by Rodríguez-Calleja, *et al.* (2006), while Khalafalla (1993) could not isolate *Yersinia enterocolitica* from examined rabbit carcasses during his study.

The contaminated rabbit cuts in the present study with *Y. enterocolitica* could be attributed to the contamination of the water used for carcass washing and preparation. Moreover, it could happen by fault during evisceration. This substantiates the hypothesis that *Yersinia enterocolitica* could be isolated from a range of environmental sources including soil, fresh

water and the intestinal tract of many animals (Adams and Moss, 1995). In this regard, it was recorded by Keet (1974) that the source of *Yersinia enterocolitica* may be from the cross-contamination between flesh and faeces.

CONCLUSION

From the present study, it could be concluded that unhygienic handling of rabbits during slaughtering, dressing, evisceration, storage and marketing is the main cause of high total bacterial population. The presence of considerable levels of faecal coliforms and *E. coli* in examined rabbit cuts is an indicator of faecal contamination of carcasses due to either fault evisceration or unclean area during preparation in the market. Higher incidences of biotype I *E. coli* in examined rabbit carcasses indicate the existence of public health risks to consumers. The presence of *Salmonella* spp. in examined rabbit cuts could be attributed to fault evisceration and/or lack of personnel hygiene, and this carries public health hazards to the consumers. While the isolation of *Y. enterocolitica* may be due to the contaminated water used during carcass washing and preparation.

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الصورة البكتيرية لذبائح الأرناب المجزأة المسوقة في محافظة بني سويف – مصر

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تهدف الدراسة الحالية إلى تقييم الوضع البكتريولوجي لذبائح الأرناب المجزأة المسوقة في محافظة بني سويف بمصر. لتحقيق هذا الغرض، تم تجميع ٢٥ ذبيحة عشوائياً من الأرناب الطازجة من أسواق الطيور والأرناب المختلفة في محافظة بني سويف خلال عام ٢٠١٥. تقييم الوضع البكتريولوجي للعينات المجمعّة جاء عن طريق تقدير العد الكلي للبكتريا الهوائية (APC) عند ٣٥ درجة مئوية، والرقم الأكثر احتمالاً (MPN) من مجموعة بكتيريا القولون، ومجموعة بكتيريا القولون البرازية وبكتيريا القولون النموذجية، بالإضافة إلى عزل وتصنيف بكتيريا القولون النموذجية (الممرضة)، وبكتيريا السالمونيلا. وبكتيريا اليرسينيا انتروكوليتيكا. وكشفت النتائج أن ٣٢، ٦٤، ٧٢ و ٥٢٪ من عينات لحوم الأرناب المفحوصة من مناطق الكتف، الخاصرة، الضلوع والفخذ، على التوالي، تجاوزت الحدود المسموحة والموصى بها وفقاً للمعايير القياسية المصرية للعدد الكلي للبكتريا الهوائية (١٠^٦ بكتريا / جم لحم) في لحوم الدواجن والأرناب. في حين أنه لم يتجاوز أي من العينات المفحوصة المعايير الدولية (١٠^٦ بكتريا / جم لحم) الخاصة بلجنة (ICMSF). وفيما يتعلق بالميكروبات الممرضة، تبين أن ١١ (٤٤٪)، ٨ (٣٢٪)، و ١٥ (٦٠٪) و ١٠ (٤٠٪) من أصل ٢٥ عينة احتوت على بكتيريا القولون النموذجية (الممرضة) في منطقة الكتف، الخاصرة، الضلوع والفخذ، على التوالي. في حين، ٣ (١٢٪)، ٣ (١٢٪)، ٣ (١٢٪) و ٢ (٨٪) احتوت على بكتيريا السالمونيلا، بالإضافة إلى ٣ (١٢٪)، ٣ (١٢٪) و ٦ (٢٤٪) و ٧ (٢٨٪) احتوت على بكتيريا اليرسينيا انتروكوليتيكا، على التوالي. وقد تم مناقشة الأهمية الصحية للميكروبات المعزولة ومصادر التلوث بها خلال هذه الدراسة.