Bacteriological study on rabbit meat

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Abstract

Rabbit meat is increasingly valued for its nutritional characteristics; it is a lean meat with a low fat, cholesterol content and of less saturated fatty acids than any other meats. Rabbit meat is thought to be a safe product since it has not been involved in outbreaks of foodborne disease. Despite this fact; rabbit can carry food-poisoning organisms derived from multiple sources. These pathogens can result in many cases of food poisoning. Therefore, the present study was conducted to evaluate the bacteriological quality of rabbit meat in MitGhamr City, Dakahlia Governorate, through determination of Enterobacteriaceae, pseudomonas, and psychrotrophic count. The obtained results revealed that the Enterobacteriaceae counts in the fresh thigh and back meat samples were ranged from 3 to 5 and 4.23 to 5.53 log10cfu/g with mean values of 3.98 ±0.103 and 4.79 ±0.094 log10cfu/g respectively, Pseudomonas counts in the fresh thigh and back meat samples were ranged from 4.70 to 7.46 and 5 to 7.38 log10cfu/g with mean values of 5.90 ±0.134and 5.98 ±0.124 log10cfu/g respectively, and the Psychrotrophes counts in the fresh thigh and back meat samples were ranged from 4.08 to 7.20 and 4.70 to 6.95 log10cfu/g with mean values of 5.67 ± 0.154 and 6.10 ±0.101 log10cfu/g respectively.

Keywords: Enterobacteriaceae, Pseudomonas, Psychrotrophic, Rabbit meat.

1. Introduction

Rabbit is thought to be an ideal meat-producing animal for having short life cycle, short pregnancy period, gestation interval and it is very productive with high feed conversion rate. Also it is characterized by a relatively low cost of production and less space needed for breeding **(Lebas*et al.* 1997**). Moreover, rabbit skin has an economic value for fur production and it is one of the most important experimental animals. Rabbits are unique among food animals. Their reproduction cycle is short, their growth rate is fast and their fertility rate is high. They are easy to transport anddo not cost too much transportation. Rabbits produce white meat that is fine grained, high in protein, low in cholesterol and fat, and rich in vitamins and minerals **(DalleZotte, 2002).**Rabbit meat is juicy, delicious of high nutritive value along with the production of fur, hair, and leather **(Tărnăuceanu*et al.*).**According to**DalleZotte*et al.* 2002,** amount of water (g), protein(g), lipid(g), energy(kj), cholesterol(mg),sodium(mg),vit B 12(mg) in 100 g of rabbit meat are 70.8, 21.3, 6.8, 618, 45, 37–47, and 8.7–11.9 subsequently.Rabbit meat is thought to be the healthiest most nutritious meat known to mankind**.** If you are a health conscious, a weight watcher and like to build muscles, rabbit meat can certainly help to optimize

your diet.it is often recommended by nutritionists over other meat types. The incorporation of rabbit meat in human diet would promote human health as it is a lean meat rich in protein of high biological value with high level of unsaturated fat, phosphorous, vitamin B and low content of cholesterol, sodium **(HERNÁNDEZ and GONDRET 2006).**

rabbit meat is thought to be a safe product since it has not been involved in outbreaks of foodborne disease **(DalleZotte, 2002).**Despite this fact, rabbit can carry food-poisoning organisms derived from multiple sources (skin, gut contents, feces, workers ,abattoir environment, cutting and packaging processes, and handling at the retail level). And subsequently spoilage will occur as a result of microbial action **(Hulot and Ouhayoun, 1999).**There are two dominant sources of bacteria causing foodborne diseases in meat. The living animal carries pathogenic bacteria, while the processing environment harbors them **(Badr, 2004)**.At the point of arrival at slaughter house, rabbits have considerable amount of microorganisms associated with them. Micro biota present on carcass surfaces may arise from the rabbit itself, especially from the fur or skin, the feet, the digestive tract and fecal contamination. Moreover, carcasses can be contaminated throughout the whole process from transport, slaughter till processing. The degree of carcass contamination depends on the cleanliness of incoming rabbit, the slaughter plant structural design (ex. the separation between clean and dirty areas), the slaughter technology, the sanitation and disinfection system, and hygiene (e.x. personnel hygiene)**(Zweifel*et al.* (2014)**.Each processing step from animal slaughtering till consumption will add microbes to the primary bacterial count and subsequently lower the keeping quality of meat. In a healthy living rabbit, muscles are sterile. However, many microbes harbor the digestive tract, lungs, skin, etc. Throughout slaughtering and evisceration, contamination of muscle tissue with a variable number of microorganisms can occur due to an increase in microbial count coming from the gastrointestinal tract **(Rouger*et al.* (2017).**

Psychrotrophic bacteria develop on meat products at chill temperatures. They belong to microbial genera of both gram positive, such as lactic acid bacteria, and gram-negative bacteria, such as Pseudomonas spp. and Enterobacteriaceae **(Ercolini*et al.*, 2009)**. Pseudomonas speciesare the major causative spoilage bacteria in meat, primarily due to their metabolic versatility and ability to produce extracellular proteases and lipases cause oxidation, color change, off - flavor, slimy form and animal tissues degradation **(Doulgeraki *et al.* 2012)**. The undesirable Presence of enterobacteriaceae in meat is used as an indicator of fecal contamination and poor hygiene during processing and storage. Its appearance within the meat of slaughtered rabbits may be due to the fact that the external part of animals and lower gastrointestinal tract harbor massive numbers of bacteria which accidently may be relocated to the surface of meat during evisceration and dressing **(Görner and Valík (2004)**.

Keeping the above view, the present study was planned to evaluate the bacteriological quality of rabbit meat in MitGhamr City, Dakahlia Governorate.

2. Materials and method

2.1.Collection of samples:

A total of fifty healthy domestic rabbits (10 weeks of age, around 2 kg live weight) were collected from Dakahlia Governorate and slaughtered manually under hygienic conditions. Meat samples were taken from the thigh and back. All samples were transferred under complete a septicconditionsto Food Control lab for,bacteriological examination.

***2.2.Preparation of samples*:** According to **APHA (2001)**.

2.3.Determination of total psychrotrophiccount: was performed on standard plate count agar (Oxiod CM325) according to **APHA (2002)**

2.4.Determination of Pseudomonas count: was performed on Pseudomonas Agar Base (CM 559; Oxoid) according to **Roberts and Greenwood (2003).**

2.5.Determination of Enterobacteriaceae* count*: was performed on violet red bile glucose agar (VRBG) agar according to **ISO21528-2 (2004).**

2.6.**Statistical analysis**

One way analysis of variance (ANOVA) was done by using the statistical package for social sciences (SPSS-14; Chicago, IL, USA). Statistical significance was evaluated using tukey-kramer honestly significant difference tests with $p < 0.05$.

3. Results and Discussion:

*Enterobacteriaceae*in meat is used as an indicator of fecal contamination and poor hygiene during processing and storage. Results illustrated in **Table (1)** revealed that the Enterobacteriaceae counts in the fresh thigh and back meat samples were ranged from 3 to 5 and 4.23 to 5.53 log10cfu/g with mean values of 3.98 ±0.103 and 4.79 ±0.094 log_{10}cfu/g respectively.

Table (1): Statistical analytical results of Enterobacteriaceae count in thigh and back muscles of the examined rabbit samples (log_{10} CFU/g)

Samples (No= 50)	Minimum	Maximum	Mean± S.E
Thigh	3	5	3.98 ± 0.103
Back	4.23	5.53	4.79 ± 0.094

CFU/g: Colony forming unit per gram; No: Number of examined samples (50 of each sample)

S.E: Standard error of mean; Means are not significantly different ($p > 0.05$)

Lower results were obtained by **Khalafalla (1993**) who mentioned that the Enterobacteriaceae count of the freshly slaughtered rabbits was $6 \times 10^2 \pm 10^2$ organisms per

gram, **Rodriguez - Calleja et al. (2005)** who found that the Initial values (log cfu/g) of Enterobacteriaceae was 0.49 ± 0.45,**Soultos et al. (2009)** who mentioned that Enterobacteriaceae count was (1.3 ± 0.38 log cfu/cm2), **Pereira and Malfeito-Ferreira (2015)** who reported that mean value ± standard deviation (log CFU g-1) of Enterobacteriaceae was 1.18± 1.35,**Cwiková and Pytel (2017)** who recorded that the Enterobacteriaceae count in samples from butcher shops, domestic slaughtered carcasses, and in frozen ones were 2.91 log CFU.g-1 , 1.47 log CFU.g-1 , 1.36 log CFU.g-1 respectively, and **Cullere et al . (2018)** who found that enterobacteriaceae count (CFU Log10) of LTL muscle at day 1 of shelf-life of Pannon White rabbits (Hungary) fed on a diet containing 3% sunflower oil or another diet having 3% linseed oil were 0.70 for both.

Pseudomonas spp., are used as general indicators of processing hygiene, storage conditions and spoilage in meat industries. It is an important meat spoilage indicator as nitrogenous compounds, including primary, secondary, tertiary amines and others, are released. Pseudomonas counts in the fresh thigh and back meat samples were ranged from 4.70 to 7.46 and 5 to 7.38 $\log_{10}$cfu/g with mean values of 5.90 ±0.134and 5.98 ±0.124 log10cfu/g respectively **Table (2).** Lower results were obtained by **Khalafalla(1993)** who mentioned that the Pseudomonas count of the freshly slaughtered rabbits was 3 x 10^2 ± 10^2 organisms per gram **,** **Rodriguez - Calleja*et al.* (2005)** who found that the Initial values (log cfu/g) of Pseudomonas was 3.39 ± 1.12,**Soultos*et al.* (2009)** who mentioned that Pseudomonas count was (3.6 ± 0.40 log cfu/cm2), **Pereira and Malfeito-Ferreira (2015)** who reported that Mean value ± standard deviation (log CFU g-1) of Pseudomonas was 2.68 ± 0.85**, Kone*et al.* (2016)** who counted Pseudomonas numbers (log CFU/g) in rabbit thighs at day 0 and found The average values was 1.03±0.38, and **Cullere*et al* . (2018)** who found that Pseudomonas count (CFU Log10) of LTL muscle at day 1 of shelf-life of Pannon White rabbits (Hungary) fed on a diet containing 3% sunflower oil or another diet having 3% linseed oil were 3.00 and 1.70 respectively.

Table (2): Statistical analytical results of Pseudomonas count in thigh and back muscles of the examined rabbit samples ($\log_{10}$ CFU/g)

Samples (No= 50)	Minimum	Maximum	Mean± S.E
Thigh	**4.70**	**7.46**	**5.90 ± 0.134**
Back	**5**	**7.38**	**5.98 ± 0.124**

CFU/g: Colony forming unit per gram; No: Number of examined samples (50 of each sample)

S.E: Standard error of mean; Means are not significantly different ($p > 0.05$)

Psychrotrophic bacteria are capable of surviving in extremely cold environment. They provide an estimation of the shelf life of meat. Significance differences were detected between

the examined samples ($P < 0.05$). The variation in counts may be attributed to improper handling and poor sanitation level during the processing steps and storage. Psychrotrophes counts in the fresh thigh and back meat samples were ranged from 4.08 to 7.20 and 4.70 to 6.95 log10cfu/g with mean values of 5.67 ± 0.154 and 6.10 ±0.101 log_{10}cfu/g respectively **Table (3)**.

Such results were nearly similar to those reported by **Rodriguez - Callej*aet al*. (2005)** who found that the initial values (log cfu/g) of psychrotrophic bacteria was 4.81 ± 0.81**, Cwiková and Pytel (2017)** who recorded that the psychrotrophic count in samples from butcher shops were 4.98 log CFU.g-1. However, Lower results were obtained by **Pereira and Malfeito-Ferreira (2015)** whoreported that Mean value ± standard deviation (log CFU g-1) of psychrotrophic was 3.63 ± 0.86, and **Cwiková and Pytel (2017)** who recorded that psychrotrophic count in samples from home slaughtered rabbits were 2.52 log CFU.g-1.

Table (3): Statistical analytical results of Psychrotrophic count in thigh and back muscles of the examined rabbit samples (log_{10} CFU/g)

Samples (No= 50)	Minimum	Maximum	Mean± S.E
Thigh	4.08	7.20	5.67 ±0.154
Back	4.70	6.95	6.10 ±0.101

CFU/g: Colony forming unit per gram; No: Number of examined samples (50 of each sample)

S.E: Standard error of mean; Means are not significantly different ($p > 0.05$)

The variation in the count may be attributed to the difference in hygienic level during slaughtering, processing, packaging and transportation which may include secondary contamination of carcasses originating from air, used tools, containers, from animal skin and fur and from packaging materials, containers.

4. Conclussion:

The obtained results in the current study declared that the examined rabbit samples were contaminated with Enterobacteriaceae, Pseudomonas and Psychrotrophic microorganisms and this may be attributed to holding of such rabbit in unhygienic conditions. So that strict hygienic measures should be applied on chicken meat.

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الملخص العربي

دراسات بكتيرولوجية علي لحوم الأرانب

السعيد أبوزيد الدالي ورشا محمد البيومي وعبد الله فكري عبد الله و رانيا حلمي شطا

قسم مراقبة الأغذية ، كلية الطب البيطرى ، الزقازيق مصر.

تتسم لحوم الأرانب بأنها ذات قيمة غذائية عالية ؛ حيث أنها غنية بالحموض الدهنية غيرالمشبعة،الفوسفور، والبروتينات عالية القيمة التي تتميز بمحتوى عال من الأحماض الأمينية الأساسية. علاوة على ذلك فان لحوم الأرانب تشكل مصدراً هاماً للمعادن والفيتامينات خاصة فيتامين ب، فيتامين ب ١٢. وجدير بالذكر، فان لحوم الأرانب لا تحتوى على حمض اليوريك. يُعتقد أن لحم الأرانب هو أكثر اللحوم الصحية المعروفة للبشرية وغالبا ما ينصح به خبراء التغذية.بالمقارنة مع أنواع اللحوم الأخرى ، تحتوي لحوم الأرانب على كمية أقل من الحموض الدهنية المشبعة والدهون (٦.٨ جم / ١٠٠ جرام من اللحوم الطازجة) ، والسعرات الحرارية (٦١٨ كيلو جول / ١٠٠ جرام من اللحوم الطازجة) وأدنى مستوي من الكوليسترول (٥٣ مغ / ١٠٠ جرام من اللحوم الطازجة) و الصوديوم كما أنه يحتوى على ١٠ أضعاف كمية البوتاسيوم الموجودة باللحوم الأخرى و أيضا نسبة جيدة من أوميغا ٣: أوميغا ٦ (٥.٩) . وبالتالي ، فلحوم الأرانب مناسبة للغاية لمرضى القلب ، وارتفاع ضغط الدم ، والنظام الغذائي للمسنين ، والوجبات الغذائية منخفضة الصوديوم ، والوجبات الغذائية المخصصة لخفض الوزن ، إلخ. تتعرض الأرانب أثناء ذبحها وتجهيزها ونقلها للتلوث بمختلف الميكروبات التي تؤدي إلي فسادها وبعض التغيرات الكيميائية كتحلل البروتين والتزنخ مما يشكل خطرا علي سلامة منتجات الأرانب وصحة الإنسان لذلك إتجهت أنظار العالم إلي تحسين الإنتاج الحيوانى ووصول لحومها إلي المستهلك في حالة جيدة وخالية من الميكروبات للحصول علي منتج عالي الجودة. أجريت هذه الدراسة على خمسين من الأرانب المنزلية التى تم تجميعها من محافظة الدقهلية وذبحها يدويًا في ظروف صحية. تم أخذ عينات اللحم من عضلات الفخذ والظهر. تم فحص العينات المجمعة بكتريولوجيًا . كشفت النتائج التي تم الحصول عليها على أن تعداد البكتيرياالمعوية في عينات الفخذ والظهر الطازجة تراوحت بين ٣ إلى ٥ ، ٤.٢٣ إلى ٥.٥٣مع متوسط قيم ٣.٩٩ ± ٠.١٠٣ ، ٤.٧٩ ± ٠.٠٩٤على التوالي. فى حين كان تعدادالسيدوموناس في عينات الفخذ والظهر الطازجة ٤.٧٠ إلى ٧.٤٦ ، من ٥ إلى ٧.٣٨مع متوسط قيم ٥.٩٠ ± ٠.١٣٤ ، ٥.٩٨ ± ٠.١٢٤على التوالي. تراوحت أعداد البكتيريا المحبة للبرودة في عينات الفخذ والظهر الطازجة من ٤.٠٨ إلى ٧.٢٠ ، ٤.٧٠ إلى ٦.٩٥مع متوسط قيم ٥.٦٧ ± ٠.١٥٤ ، ٦.١٠ ± ٠.١٠١على التوالي.