Assessment of Microbial Quality of Processed Beef Products Sold in Tripoli, Libya

Hanan Lotfi Eshamah and Hesham Taher Naas

Department of Food Hygiene, Faculty of Veterinary Medicine, University of Tripoli

_____

Abstract

This study evaluated the microbial safety of two of the most popular and locally processed beef products in Tripoli, Libya. Forty samples were randomly collected (20 beef patties and 20 merguez) from various retail locations. Samples were analyzed microbiologically to assess contamination rates and the presence of possible foodborne pathogens. Total viable counts (TVC), coliform bacteria, *Staphylococcus aureus*, and *Salmonella spp.* were evaluated using established microbiological procedures. The outcomes showed marked microbial contamination in both products, with differences linked to varying handling, processing, and storage practices. Merguez samples exhibited higher microbial contamination level than beef patties, with TVC reaching up to 7.0 in merguez and 6.4 $\log_{10}$ CFU/g in beef patties. Coliform levels similarly showed higher values in merguez (3.5 $\log_{10}$ CFU/g) compared to patties (2.9 $\log_{10}$ CFU/g). *S. aureus* was detected in 60% of merguez samples while reached 40% of beef patties. *Salmonella spp.* was not detected in any of beef patties samples, whereas it reached up to 10% in merguez samples. These results highlighted the necessity for enhanced hygiene measures and monitoring systems in meat processing and retail settings to ensure the safety of consumers.

Keywords: Beef patties, Merguez, Microbial quality, TVC, Salmonella, *S. aureus*, Coliform.

_____

Introduction

Meat and meat products are recognized for their substantial nutritional benefits, particularly as excellent sources of high-quality protein, bioavailable iron, zinc, and B-complex vitamins (Majeed *et al.,* 2023). However, their nutritional importance is undermined by their high susceptibility to contamination. Microbial contamination can occur at multiple points in the production chain, and persistent gaps in hygienic practices continue to allow meat to act as an effective vehicle for foodborne pathogens, contributing significantly to global disease burdens (Rani *et al.,* 2023). Despite longstanding awareness of these risks, improving hygienic control within many meat supply systems remains challenging. Merguez (fresh sausages) is a traditional North African raw sausage prepared from minced beef or mutton mixed with different spices and stuffed into natural intestinal casing. Its small diameter, raw composition and short

shelf life even under refrigeration make it especially prone to microbial deterioration (Hachemi *et al.*, 2019). Merguez is widely sold in local markets, often with minimal temperature control. Previous studies have drawn attention to its association with foodborne pathogens (Hamiroune *et al.*, 2017; Hanane *et al.*, 2022), this has risen concerns about the adequacy of current handling and storage practices. Globally, foodborne diseases affect an estimated 600 million people annually, with meat and meat products implicated in many outbreaks (WHO, 2020). *Salmonella spp.*, *Escherichia coli*, *Listeria monocytogenes,* and *Staphylococcus aureus* remain among the primary pathogens associated with these outbreaks. The prominence of *Salmonella* as a leading foodborne pathogen (Ehuwa *et al.*, 2021) and the persistent risk posed by *S. aureus* in meat systems (Bortolaia *et al.*, 2016) further emphasize the need for product specific microbiological evaluation. The microbiological safety of meat products depends on the initial microbial load of raw materials, hygiene in processing environments, temperature control during storage and transport, and careful post-processing handling (Singh *et al.,* 2020). Processed beef products, like patties and merguez, are particularly susceptible to microbial growth due to the production processes and shaping that enhance the product's surface area and increase exposure to contaminants. Furthermore, merguez is commonly sold in its raw state, without any prior cooking or smoking, which amplifies the importance of rigorous cold chain management

and proper handling procedures (Anas *et al.,* 2019 and Adesola *et al.*, 2024). In Libya, much like in numerous developing countries, the application of food safety regulations is often inconsistent. Previous studies have highlighted the lack of regular microbiological monitoring in small-scale meat production and informal market environments, along with insufficient refrigeration and limited training for food handlers (Albie, 2019; Hamza & Elshrek, 2019; Eshamah *et al.,* 2020 and Akwieten *et al.*, 2022). Although separate studies have examined the microbiological safety of processed beef products in Libya, there is a lack of comparative research specifically looking at beef patties and merguez sold in retail settings. Therefore, this study analyzed and compared the microbial characteristics of retail beef patties and merguez available in Tripoli. By identifying contamination patterns and potential risk points, the findings are expected to support public health authorities in designing focused safety strategies and strengthening consumer protection regulations.

Materials and Methods

Study Design and Sample Collection

This cross-sectional study was carried out from January to March 2025 in Tripoli, Libya. Forty beef products samples were randomly selected, consisting of 20 raw beef patties and 20 raw merguez. The samples were purchased from a variety of supermarkets and butcher shops situated across five districts in Tripoli to ensure diversity in sources, brands, and hygiene practices. Each sample, weighing around 250 grams, was aseptically placed into sterile

polyethylene bags, stored in portable insulated coolers with ice packs to keep the temperature between 0–4°C, and transported to the Meat Hygiene Laboratory at the faculty of Veterinary Medicine, University of Tripoli within two hours of collection. Microbial analyses were initiated within four hours of samples collection.

Sample Preparation and Dilution

Ten grams of each sample homogenized with 90 mL of buffered peptone water (Oxoid PW1049-8L), and blended using a laboratory stomacher (Stomacher® 400, UK) for one minute. Subsequently, serial decimal dilutions were made up to 10^{-6} using sterile BPW to enable the counting of target microorganisms (ISO 6887-1:2017).

Microbiological Analyses

Appropriate sample dilutions were inoculated onto selective and differential media to isolate and enumerate specific groups in duplicate. Total Viable Count (TVC) was determined using Plate Count Agar (Oxoid CM0325B) incubated at 37°C for 48 hours (ISO 4833-1:2013). Coliforms were isolated on MacConkey agar (Oxoid CM07B) and incubated at 37°C for 24 hours (ISO 4832:2006). For *Staphylococcus aureus*, Samples were cultured on Baird-Parker agar (Oxoid CM0275B) supplemented with egg yolk tellurite emulsion (Oxoid SR054C) and incubated at 37°C for 24-48 hours and confirmed using the coagulase test (ISO 6888-1:2021). For *Salmonella spp*. isolation involved pre-enrichment in BPW (Oxoid PW1049-8L) for 18 hours at 37°C, selective enrichment in selenite cystine broth (Oxoid CM0699T) and plating on

Xylose Lysine Deoxycholate agar (Oxoid CM0469B), with final identification confirmed by biochemical tests (H2S, urease, oxidase, citrate and indole test) following Andrews *et al.*, (2018). Microbial counts are expressed as CFU/g.

Logarithmic transformation of microbial counts was conducted to achieve data normalization. Differences in microbial loads between beef patties and merguez samples were analyzed using one-way analysis of variance (ANOVA), with statistical significance established at $p<0.05$. All analyses were performed using SPSS software version 27.0 (IBM Corp., Armonk, NY, USA).

Results and Discussion

Microbiological examinations of 40 processed beef samples (20 beef patties and 20 merguez) revealed significant differences in microbial contamination levels between the two product types. This study showed that both beef patties and merguez sold in Tripoli have microbial loads that are higher than both locally and internationally recognized safety thresholds.

According to the Libyan National Center for Standardization and Metrology (LNCSM, 605:2009 and 813-2015), the microbiological quality of beef patties and merguez should have no *Salmonella*, a maximum of 5-6 $\log_{10}$ CFU/g of APC and 2-3 $\log_{10}$ CFU/g of S. aureus. Merguez was consistently showing higher contamination levels (Fig. 1). These differences likely reflect both the intrinsic properties of the merguez product such as increased surface area and processing steps and extrinsic factors

including handling conditions prevalent in local markets. A one-way analysis of variance (ANOVA) revealed significant differences (p<0.05) in TVC and S. aureus levels between beef patties and merguez samples. Although there were noticeable differences in coliform counts, they did not achieve statistical significance.

Microbial Risks and Public Health Implications

Total Viable Count (TVC)

The mean total viable count for beef patties was $6.4 \log_{10}$ CFU/g, while merguez showed a higher mean value of $7.0 \log_{10}$ CFU/g (Fig. 1 & Table 1). According to the European Commission Regulation (EC) No. 2073/2005, the microbial limit for total aerobic mesophilic bacteria in ready-to-eat beef products is $6.0 \log_{10}$ CFU/g. Both product types exceeded this threshold, particularly the merguez samples, indicating inadequate hygienic procedures during manufacturing, storage and retail stages. Elevated TVCs are commonly associated with product spoilage, reduced shelf-life, and may coincide with increased pathogen presence (Mortazavi et al., 2023). Comparable microbial risks have been reported in similar urban environments across North Africa and the Middle East, where ambient temperature abuse and informal market practices exacerbate contamination (Erdem et al., 2014; Hamad et al., 2019; Akwieten et al., 2022; and Manna et al., 2022) .
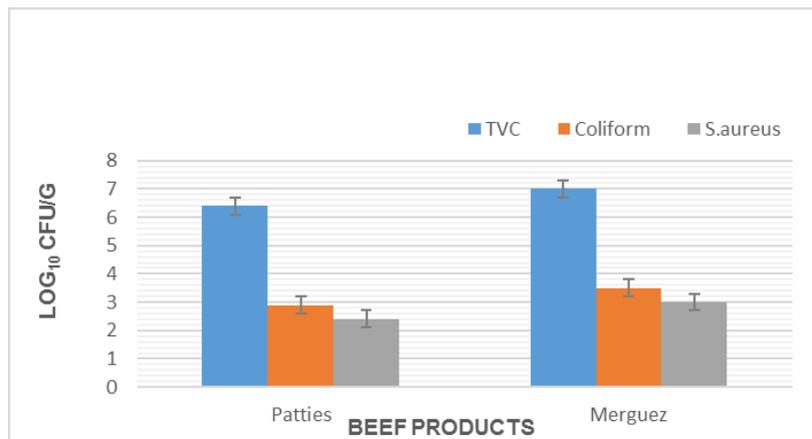

Figure 1. Microbial counts (Mean±SD) in beef products

Table 1. Total viable count of beef products samples

Meat products	No. of samples	Positive samples		Total Viable Count ($\log_{10}$ CFU/g)		
		No.	%	Min.	Max.	Mean
Beef Patties	20	20	100	5.6	7.2	6.4
Merguez	20	20	100	6.2	7.8	7

Staphylococcus aureus

S. aureus was detected in 40% of beef patties samples and 60% of merguez samples. The mean counts were 2.4 and 3.0 $\log_{10}$ CFU/g, respectively (Table,3). Merguez samples approached the EC No. 2073/2005 regulatory safety limit for *S. aureus* (3.0 log10 CFU/g), suggesting significant cross contamination from food handlers. This high level likely originates from human skin or mucosa due to poor personal hygiene and insufficient glove use by meat handlers, a finding consistent with reported inadequate hygienic practices in butcher shops (Hamiroune *et al.*, 2017; Hachemi *et al.*, 2018; Manaa *et al.*, 2022; and Faour-Klingbeil *et al.*, 2025) .

Coliform Bacteria

Coliforms were detected in 70% of beef patties samples and 85% of merguez samples. The mean counts were 2.9 and 3.5 $\log_{10}$ CFU/g, respectively (Table 2). Some local and regional previous studies showed similar high prevalence of coliform in tested meat products (Hamiroune *et al.,* 2017; Albie, 2019; Hamza & Elshrek 2019; and Manna *et al.*, 2022). Despite the fact that EC No. 2073/2005 does not set specific coliform limits, their existence is generally recognized as a sign of fecal contamination or unsanitary conditions in processing settings. Elevated coliform counts in both product types emphasize the need for infrastructural improvements in Tripoli's meat retail sector, encompassing sanitation of surfaces, effective waste management, and enforcement of hand hygiene protocols.

Table 2. Coliform count in beef products samples

Meat products	No. of samples	Positive samples		Coliform Count ($\log_{10}$ CFU/g)		
		No.	%	Min.	Max.	Mean
Beef Patties	20	17	85	2.5	3.3	2.9
Merguez	20	14	70	2.8	4.2	3.5

Table3. *Staphylococci* count in beef products samples

Meat products	No. of samples	Positive samples		*Staphylococci* Count ($\log_{10}$ CFU/g)		
		No.	%	Min.	Max.	Mean
Beef Patties	20	8	40	2.2	2.6	2.4
Merguez	20	12	60	2.8	3.2	3

Salmonella spp.

Salmonella spp. was not detected in any of the beef patties samples, while it was isolated in 10% of merguez samples (Table 4). This finding is important considering the strict zero-tolerance policy for *Salmonella* in 25 g of ready-to-eat meat products, as established by EC No. 2073/2005. Even a small occurrence poses a considerable food safety threat, especially if such products are eaten undercooked or not stored correctly. The isolation of *Salmonella spp.* in 10% of merguez samples, despite its relatively low occurrence, represents a critical food safety hazard due to the pathogen's low infectious dose and significant disease burden. The zero-tolerance standard for *Salmonella* in ready-to-eat meat stipulated by EC 2073/2005 necessitates prompt corrective measures. Globally, *Salmonella* accounts for over 150,000 deaths annually predominantly linked to contaminated animal products (WHO, 2015). Regional studies on meat contamination present mixed findings regarding *Salmonella* presence. While Manna *et al.* (2022) (testing sausage, and beef burger in Egypt), Abbassi-Ghozzi *et al.*, (2012) (testing merguez in Tunisia) and Hamiroune *et al.*, (2017) (testing Merguez in Algeria) all reported the absence of *Salmonella*. Contrasting studies by Ed-Dra *et al.*, (2017) (testing sausage in Morocco) and Albie (2019) (testing sausage and minced meat in Libya) both found high occurrence of *Salmonella* 21.8%, 20% and 10% respectively. The comparison of results requires suspicion due to potential influencing factors, including the development level between countries, site location and climate, source of raw material, sampling season, hygienic standards of production units, and specific isolation methods.

Table 4. *Salmonella* occurrence in beef products samples

Meat products	No. of samples	Positive samples	
		No.	%
Beef Patties	20	0	0
Merguez	20	2	10

Hygiene Gaps and HACCP Applicability

The microbial profiles identified reflect critical hygiene shortcomings along the meat production and supply chain in Tripoli, including: Inadequate temperature control during storage and transit, manual handling of raw meat without gloves, insufficient cleaning and sanitation of grinding and mincing equipment, and lack of routine microbiological testing in small-scale processing units

Implementation of HACCP systems in meat processing facilities could substantially mitigate

these risks. Monitoring critical control points such as grinding, refrigeration, and packaging phases would allow timely intervention before hazards manifest (FAO/WHO, 2020). Further integration of Good Hygienic Practices (GHP) and Good Manufacturing Practices (GMP), especially within small- and medium-sized enterprises, is essential. Training food handlers, enforcing sanitary standard operating procedures (SSOPs), and conducting regular microbiological surveillance will improve overall product safety.

International Benchmarking

Traditional foods have been linked to infectious diseases and intoxications, as well as with other food safety pathogens. However, there have only been a limited number of recorded outbreaks related to traditional foods in North African countries due to low public awareness and a lack of media coverage, particularly when instances of intoxication are mild or do not necessitate emergency hospital visits (Benkerroum, 2013).

Similar research conducted in Tunisia, Egypt, and Algeria revealed consistent trends of significant microbial contamination in raw meat products. For example, studies highlighted that Egyptian street sausages had total viable counts averaging 7.1 $\log_{10}$ CFU/g (Hassanin *et al.,* 2015) and 4.7 $\log_{10}$ CFU/g (Ragab et al., 2016), while 55% of market sausages in Algeria were found to contain S. aureus (Hamiroune *et al.,* 2017). This regional observation underlines widespread issues linked to infrastructural and regulatory limitations.

In Libya, like other developing countries there are some hindrances unrest the enforcement of safety measures and the distribution of resources; however, targeted strategies such as educational campaigns for consumers, subsidized cold chain systems, and safety audits through public and private partnerships can significantly mitigate risks, even in settings with limited resources.

Conclusion

The microbiological safety of beef patties and merguez sold in Tripoli, Libya represented a serious public health issue, with merguez exhibiting significantly higher microbial loads. The presence of coliforms and Staphylococcus aureus in a majority of the samples, and Salmonella spp. in a subset of merguez, points to lapses in hygiene throughout the meat processing and retail chain. Generally, the evidence indicated a continuous danger of microbial contamination in meat products, both in Libya and throughout the world. The frequent detection of pathogens like *Salmonella* and *S. aureus* necessitates urgent and comprehensive action to protect consumers. This requires immediate enhancements in hygiene, cold chain management, food handler training, and regulatory enforcement. Implementing HACCP systems and better surveillance will establish systematic risk mitigation strategies throughout the meat supply chain in Libya.

References

Abbassi-Ghozzi, I.; Jaouani, A.; Hammami, S.; Martinez-Urtaza, J.; Boudabous, A., & Gtari, M. J. P. B.(2012. Molecular analysis and antimicrobial resistance of *Salmonella* isolates recovered from raw meat marketed in the area of "Grand Tunis", Tunisia. Pathologie Biologie, 60(5), e49-e54. doi:10.1016/j.patbio.2011.07.005.

Adesola, R. O.; Hossain, D.; Ogundijo, O. A.; Idris, I.; Hamzat, A.; Gulumbe, B. H. & Lucero-Prisno III, D. E. 2024. Challenges, health risks and recommendations on meat handling practices in Africa: A comprehensive review. Environmental health insights,18, 11786302241301991. doi:10.1177/11786302241301991.

Akwieten, H.; Hamad, R.; Saleh, A.; Mohammed, K. & Abd Al Aziz, M. 2022. Microbial profile of some ready to eat meat products retailed for sale in Al Beida City, Libya. Damanhour Journal of Veterinary Sciences, 7(2), 1-5. doi:10.21608/djvs.2021.95176.1049

Albie, A. A. 2019. Bacteriological Quality and Isolation Some Pathogenic Bacteria from Some Meat Products Sold in Some Local Markets of West Libya (Alzawi, Surman, Sabratha and Algelat). Journal of Pure & Applied Sciences, 18(4). doi:10.51984/jopas. v18i4.563

Anas, M., Ahmad, S., & Malik, A. 2019. Microbial escalation in meat and meat products and its consequences. In Health and safety aspects of food processing technologies. pp. 29-49. Cham: Springer International Publishing. doi.:10.1007/978-3-030-24903-8-3.

Andrews, W. H., Wang, H., Jacobson, A., Hammack, T., & Food and Drug Administration. 2018. Bacteriological analytical manual (BAM) chapter 5: Salmonella. Bacteriological Analytical Manual, 110, 1-25. www.fda.gov/food/laboratory-methods-food/bacteriological-analytical-manual-bam-chapter-5-salmonella.

Benkerroum, N. 2013. Traditional fermented foods of North African countries: technology and food safety challenges with regard to microbiological risks. Comprehensive Reviews in Food Science and Food Safety, 12(1), 54-89. doi:10.1111/j.1541-4337.2012.00215. x.

Benkerroum, Noreddine. "Traditional fermented foods of North African countries: technology and food safety challenges with regard to microbiological risks." Comprehensive Reviews in Food Science and Food Safety 12, no. 1 (2013): 54-89. doi:10.1111/j.1541-4337.2012.00215.x.

Bortolaia, V., Espinosa-Gongora, C., & Guardabassi, L. J. C. M. I. 2016. Human health risks associated with antimicrobial-resistant Enterococci and *Staphylococcus aureus* on poultry meat. Clinical Microbiology and Infection, 22(2), 130-140. doi.org/10.1016/j.cmi.2015.12.003.

Djenane, D.; Yangüela, J.; Amrouche, T.; Boubrit, S.; Bousaâd, N. and Roncalés, P. 2011. Chemical composition and antimicrobial effects of essential oils of Eucalyptus globulus, Myrtuscommunis and Saturejahortensis against *Escherichia coli* O157:H7 and *Staphylococcus aureus* in minced beef. Food

Science and Technology, 22, 1046-1053. doi:10.1177/1082013211398803.

Ed-Dra, A., Filali, F. R., Karraouan, B., El Allaoui, A., Aboulkacem, A., & Bouchrif, B. 2017. Prevalence, molecular and antimicrobial resistance of *Salmonella* isolated from sausages in Meknes, Morocco. Microbial pathogenesis, 105, 340-345. doi:10.1016/j.micpath.2017.02.042.

Ehuwa, O., Jaiswal, A. K., & Jaiswal, S. 2021. Salmonella, food safety and food handling practices. Foods, 10(5), 907. doi:10.3390/foods10050907.

Erdem, A.K., Saglam, D., Didem, O.Z.E.R. and Ozcelik, E. 2014. Microbiological quality of minced meat samples marketed in Istanbul. Van Vet. J., 25(3), 67-70.

Eshamah, H. L., Naas, H. T., Garbaj, A. M., Azwai, S. M., Gammoudi, F. T., Barbieri, I., & Eldaghayes, I. M. 2020. Extent of pathogenic and spoilage microorganisms in whole muscle meat, meat products and seafood sold in Libyan market. Open veterinary journal, 10(3), 276-288. doi:10.4314/ovj.v10i3.6.

European Commission. 2005. Commission Regulation (EC) No. 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs. Official Journal of the European Union, L 338/1. www.eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32005R2073.

FAO/WHO. 2020. HACCP system and guidelines for its application. Food and Agriculture Organization / World Health Organization. Available on: www.fao.org/4/y5307e/y5307e03.htm.

Faour-Klingbeil, D., Osaili, T. M., Shalaby, H. Y., Hassan, F., & Todd, E. C. 2025. The State of Food Safety Knowledge, Attitudes, and Practice in the Food Establishments in the Arab Countries. doi:10.20944/preprints202504. 0146.v1.

Hachemi, A., Zenia, S., Denia, M. F., Guessoum, M., Hachemi, M. M., & Ait-Oudhia, K. 2019. Epidemiological study of sausage in Algeria: Prevalence, quality assessment, and antibiotic resistance of *Staphylococcus aureus* isolates and the risk factors associated with consumer habits affecting foodborne poisoning. Veterinary World, 12(8), 1240. doi:10.14202/vetworld.2019.1240-1250

Hamad, R. M. A. and Saleh, A. A. H. 2019. Incidence of Some Food Poisoning Bacteria in Raw Meat Products with Molecular Detection of Salmonella in Al Beida City, Libya. AJVS. 61 (2), 11-17. doi: 10.5455/ajvs.42046.

Hamiroune, M., Saidani, K., Naceur, R., Belarbi, H. S., Foughalia, A., & Berber, A. 2017. Microbiological quality of Merguez in some retailing meat shops in the region of Msila (Algeria). African Journal of Microbiology Research, 11(6), 211-217. doi.org/10.5897/AJMR2016.8406.

Hamza, I. B., & Elshrek, Y. 2019. Microbiological quality of fresh sausage Marketed in Tripoli city, Libya. In 4th International Conference on Food Microbiology and Food Market. New York, USA.

Hanane, A., Meriem, N., & Noureddine, R. 2022. Antimicrobial activity of garlic (*Allium* sativum L.) in the preservation of Merguez, a traditional Algerian sausage. Turkish Journal of

Agriculture-Food Science and Technology, 10(4), 613-620. doi.org/10.24925/turjaf.v10i4.613-620.4669

Hassanin, F. S., Hassan, M. A., & Helmy, S. A. 2015. Enterobacteriaceae in meat products sold by street vendors. Benha Veterinary Medical Journal, 29(2), 74-79. www.bvmj.bu.edu.eg.

International Commission on Microbiological Specifications for Foods (ICMSF). 2005. Microorganisms in foods 2: Sampling for microbiological analysis. 2nd Ed. Springer.

International Organization for Standardization ((ISO 6579-1:2017). Microbiology of the food chain — Horizontal method for the detection, enumeration and serotyping of Salmonella

International Organization for Standardization (ISO 4833-1:2013). Microbiology of the food chain — Enumeration of microorganisms — Colony count at 30°C by the pour plate technique

International Organization for Standardization (ISO 6887-1:2017). Microbiology of the food chain — Preparation of test samples, initial suspension and decimal dilutions for microbiological examination — Part 1: General rules

International Organization for Standardization (ISO 6888-1:2021). Microbiology of food and animal feeding stuffs - Horizontal method for the enumeration of coagulase-positive staphylococci (*Staphylococcus aureus* and other species)

Libyan National Center for Standardization and Metrology (LNCSM 605: 2009) Meat patties.

Libyan National Center for Standardization and Metrology (LNCSM 813: 2015) Sausages.

Majeed, T., Maqbool, N., Sajad, A., Aijaz, T., & Khan, Z. S. 2023. Meat as a functional food for health. In Functional foods. 1st Ed. pp. 177-205. CRC Press .

Manaa, O., Mahran, A., Ahmed, A., Helal, I., & Shaheen, H. 2022. Rapid Assessment of Spoilage and Food Poisoning Microbes in Common Meat Products. Suez Canal Veterinary Medical Journal. SCVMJ, 27(2), 243-258. doi.org/10.21608/scvmj.2022.271375.

Mohamed A. D. 2017. The microbiological study of minced meat in some markets in Alexandria with reference to E coli O157 H:7 International Journal of Research-Granthaalayah, 5(9),26-35. doi:10.5281/zenodo.999193.

Mortazavi, S. M. H., Kaur, M., Farahnaky, A., Torley, P. J., & Osborn, A. M. 2023. The pathogenic and spoilage bacteria associated with red meat and application of different approaches of high CO^2 packaging to extend product shelf-life. Critical reviews in food science and nutrition, 63(12), 1733-1754. doi:10.1080/10408398.2021.1968336.

Mrema, N., Mpuchane, S., & Gashe, B. A. 2006. Prevalence of *Salmonella* in raw minced meat, raw fresh sausages and raw burger patties from retail outlets in Gaborone, Botswana. Food Control, 17(3), 207-212.

doi: 10.1016/j.foodcont.2004.09.019.

Ragab, W. S., Hassan, E. A., Al-Geddawy, M. A., & Albie, A. A. 2016. Bacteriological quality of some meat products in the Egyptian retail

markets. Assiut J. Agric. Sci, 47(6-2), 422-429. www.aun.edu.eg/faculty_agriculture .

Rani, Z. T., Mhlongo, L. C., & Hugo, A. (2023. Microbial profiles of meat at different stages of the distribution chain from the abattoir to retail outlets. International Journal of Environmental Research and Public Health, 20(3), 1986. doi.org/10.3390/ijerph20031986.

Singh, M., Rama, E. N., Kataria, J., Leone, C., & Thippareddi, H. 2020. Emerging meat processing technologies for microbiological safety of meat and meat products. Meat and Muscle Biology, 4(2). doi.org/10.22175/mmb.11180.

World Health Organization (WHO) 2015. WHO Estimates of the Global Burden of Foodborne Diseases: Foodborne Disease Burden Epidemiology Reference Group 2007−2015. Retrieved on August 2, 2025. Available online: www.who.int/foodsafety/publications/foodbornedisease/fergreport/en ./

World Health Organization (WHO) 2020. Food safety: Key facts. Retrieved from: www.who.int/news-room/fact-sheets/detail/food-safety.

تقييم الجودة الميكروبية لمنتجات لحوم الأبقار المصنعة المباعة في طرابلس، ليبيا

حنان لطفى الشماح و هشام الطاهر النعاس

قسم الرقابة الصحية على الأغذية، كلية الطب البيطرى، جامعة طرابلس، ليبيا

_____

المستخلص

هدفت هذه الدراسة إلى تقييم السلامة الميكروبية لإثنين من أهم منتجات لحوم الأبقار المُصنّعة والمنتجة محليا في مدينة طرابلس - ليبيا. تم جمع 40 عينة عشوائياً (20 أقراص اللحم المفروم و20 مرقاز) من مختلف محلات بيع اللحوم، وتم إختبارها مكروبيولوجيا لتقييم معدلات التلوث وإحتمالية وجود مسببات أمراض منقولة بالغذاء. قُيّمت الأعداد الكلية الحية والبكتيريا القولونية، والمكورات العنقودية الذهبية، وبكتيريا السالمونيلا، باستخدام الإختبارات المكروبيولوجية المُعتمدة. أظهرت النتائج تلوثاً ميكروبياً ملحوظاً في كلا المنتجين، مع وجود إختلافات مرتبطة بإختلاف ممارسات المناولة والتجهيز. أظهرت عينات المرقاز مستويات أعلى من التلوث الميكروبي مقارنة بعينات أقراص اللحم البقري، حيث وصلت أعداد البكتيريا الكلية الحية لعينات المرقاز وأقراص اللحم البقري إلى 7.0 و 6.4 و ت م / لو10 على التوالي. كما سجلت بكتيريا القولون قيماً أعلى في عينات المرقاز (3.5 و ت م / لو10) مقارنة بأقراص اللحم البقري(2.9 و ت م / لو 10). وتم الكشف عن العنقودية الذهبية في 60 % من عينات المرقاز بينما وصلت 40 % في عينات أقراص اللحم البقري. ولم تُكتشف بكتيريا السالمونيلا في أي من عينات أقراص اللحم البقري، في حين بلغت نسبة وجودها 10% في عينات المرقاز. تُسلّط نتائج هذه الدراسة على ضرورة تعزيز إجراءات النظافة وأنظمة المراقبة في أماكن تجهيز وبيع اللحوم لضمان سلامة المستهلكين.

الكلمات الدالة: أقراص لحم الأبقار، مرقاز، الجودة الميكروبية، الأعداد الكلية الحية، السالمونيلا، المكورات العنقودية الذهبية، البكتيريا القولونية.

_____