MEDVIX PUBLICATIONS

Journal of Medical and Clinical Case Reports
Review Article | Open Access | ISSN 2997-6022 | Volume 01 | Issue 06

# Our Opinion on Using of Irradiation in Food Preservation and Production

**Fahim A. Shaltout**[1*]

[1]Food Control, Faculty of Veterinary Medicine, Benha University, Egypt.

**Received date:** 15 July 2024; **Accepted date:** 01 August 2024; **Published date:** 05 August 2024

**Corresponding author:** Fahim A. Shaltout, Food Control, Faculty of Veterinary Medicine, Benha University, Egypt. ORCID https://orcid.org/0000-0002-8969-2677

**Citation:** Fahim A. Shaltout, Our Opinion on Using of Irradiation in Food Preservation and Production. Journal of Medical and Clinical Case Reports 1(6). https://doi.org/10.61615/JMCCR/2024/AUG027140805



**Abstract**

The meat irradiation is a tried and true method that is used to improve the food quality and the food safety of the meat. By the application of this method, the growth of bacteria, viruses, and parasites is successfully inhibited. 'By using postponing spoiling and inhibiting the growth of the microorganisms, also extends the meat shelf life and improves the food quality of the meat'. The right dosage is applied; the meat radiation has no action on the meat colour, the meat taste, or the meat texture. Its effect on the chemical and the nutritional properties of the meat is more complicated, though, as it may change the meat vitamins, the meat fatty acids, and the meat amino acids, and produce the free radicals that oxidise the meat fat. The effect of these modifications is dependent on a number of factors, such as the kind of meat, the meat storage conditions, and the meat radiation exposure. The Meat physical characteristics, such as meat softness, the meat texture, and the meat's dose-dependent ability to retain water, can also be affected by the radiation. Low doses of meat radiation may enhance the meat texture and the meat's softness, while excessive doses cause the meat's protein denaturation, which adversely affects the meat's characteristics. The regulatory and public perception elements of meat irradiation are also examined in this study. Although meat radiation is permitted and regulated in many nations, its use is debatable and causes anxiety in the public. Meat irradiation is a dependable method of improving the food safety and the food quality of the meat; nevertheless, it is important to take into account the action it may have on the chemical, physical, and nutritional characteristics of the meat product when selecting the right dosage and application. The long-term action of the radiation on the meat product and allay the consumer worries, further studies are required.

**Keywords:** meat irradiation**,** quality, safety, meat.

## Introduction

The Meat is a valuable element of the human diet as it contains essential elements such as protein, vitamins, and minerals. The meat is also vulnerable to microbial pathogens and spoilage, posing significant risks to human health. Ionizing radiation is used in meat irradiation to maintain the food safety and quality of the meat **[1,2,3,4,5,6,7 and 8]**.

For several decades, meat irradiation has been used to lower microbial contamination and extend the storage period. The procedure entails subjecting the meat item to a regulated amount of ionizing radiation, usually accomplished by applying the gamma rays, the electron beams, or the X-rays. The radiation disrupts the DNA and other cellular components of the microorganisms, making them unable to reproduce and causing their death. The procedure also breaks down some of the molecules in the meat product, which can affect its nutritional quality and sensory properties **[46,47,48,49,50,51,52,53 and 54]**.

'Despite its potential benefits, meat irradiation remains controversial, with concerns about its food safety, efficacy, and effect on the nutritional quality and sensory properties of meat products' **[55,56,57,58,59,60,61,62 and 63]**. Some critics argue that meat irradiation could create harmful compounds or destroy essential nutrients. In contrast, others questioned the need for irradiation, considering other meat safety measures, such as good manufacturing practices and meat testing. The Consumer acceptance of irradiated meat products also needs to be addressed, with some people expressing concerns about their food safety and acceptability **[73,74,75,76,77,78,79,80 and 81]**.

This comprehensive research aims to critically evaluate the existing literature on meat irradiation and its repercussions on the food quality and food safety of the meat. 'The proof of the irradiation's effectiveness at lowering microbial contamination and prolonging the shelf life of the meats is explored along with its potential effect on the physical and' chemical characteristics, the nutrient content, and the sensory properties **[92, 93, 94, 95, 96, 97, 98, 99 and 100]**. This paper will also address the regulatory framework for meat irradiation, including labeling requirements and government oversight, as well as identify areas for further research and policy development **[101,102,103,104,105,106,107 and 108]**.

## The Sources and the Principles of Meat Irradiation

The Ionizing radiation, such as the gamma rays, X-rays, or high-energy electrons, is used to irradiate the meat. The meat irradiation is determined by the absorbed dose expressed in Gray (Gy) or kilo Gray (kGy), with 1 Gray being equivalent to 1 J/kg of product. The method is considered a safe and effective way to decrease or eliminate hazardous microorganisms, prolong the shelf life, as well as enhance the food quality and food safety of the meat products. The principles of meat irradiation are determined by the ability to disrupt the genetic material of the microorganisms, preventing them from reproducing or causing illness. The irradiation affects the microorganisms'

genetic material (the DNA or the RNA) directly and indirectly. Direct irradiation can break the bonds between the base pairs in the genetic material, killing the cell's reproduction ability. The damage to the water molecules creates free radicals and reactive oxygen species, which damage the genetic material indirectly **[134,135,136,137,138,139 and 140]**. 'The Irradiation also helps to break down certain enzymes and the proteins in the meat that can contribute to the spoilage and increasing the shelf life' **[141,142,143,144,145 and 146]**. USA, Canada, as well as several European and Asian nations, allow meat irradiation by using the Cobalt-60, the cesium-137, and the electron-beam accelerators. The Cobalt-60, the most prevalent source of ionizing radiation for meat irradiation, is a radioactive isotope that emits gamma rays capable of penetrating deep into the meat products to destroy harmful microorganisms. Cesium-137 is another source of ionizing radiation, although it is less commonly used than cobalt-60. In addition, the electron-beam accelerators are used for the meat irradiation. These devices generate high-energy electrons that can penetrate the meat products to eliminate harmful microorganisms and extend the shelf life **[154,155,156,157,158,159 and 160]**. Irradiating meats has several benefits, including multifunctional applications as well as guaranteed food safety and food security. The spectrum produced is effective against the bacterial spores across a broad range of concentrations. The processing does not involve heat, it is safe for the meat, does not significantly lower the nutrient levels, leaves no chemical residues, and is simple to control during use **[37,38,39,40,41,42,43,44 and 45]**. To effectively lengthen the lifespan of the irradiated meat products, the following principles must be observed as the Radurization uses low doses of 0.1–1 kGy. This amount inhibits respiration, delays ripening, disinfects pests, and inactivates the Trichinella parasite. The Radicidation is referred to as a moderate dose. This radiation uses a quantity of approximately (1–10 kGy), which has the action of reducing the spoilage and the microbial pathogens including Salmonella sp. and the Listeria monocytogenes. This dosage is typically found in frozen meats and its application is identical to that of pasteurization, except the irradiation does not rely on the thermal energy. The Radapertization uses extremely high doses which are above or equal to (10 kGy), ranging between (30 and 50 kGy). This dose is typically used in the sterilization process because its action can kill all microorganisms in the meat up to the level of spores **[161,162,163,164 and 165]**. The meat irradiation sources and the principles are based on the ability of the ionizing radiation to disrupt the genetic material of the microorganisms, the enzymes, and the proteins in the meat products, culminating in improved food safety and food quality. The use of irradiation is regulated by the national and international authorities to ensure its food safety and effectiveness **[166,167,168,169,170 and 171]**.

## The Action of the Irradiation on the Meat

### The Microbial food safety

The Microbial food safety is a critical aspect of meat production and consumption, as these products can be a source of various harmful microorganisms that can cause food-borne diseases. The Meat products are potentially contaminated with various pathogens, such as Salmonella, Escherichia coli, Campylobacter, and Listeria monocytogenes, leading to severe illness or death in vulnerable populations **[9,10,11,12,13,14,15 and 16]**. Contamination might occur at the production, processing, or distribution stage, including on the farm, during transport, in the slaughterhouses or the processing facilities, and in the retail outlets or at the home. The Improper handling and storage of the meat products can also increase the risk of contamination. Food-borne disease outbreaks related to meat have been reported globally, with various types of products being implicated, including ground beef, chicken, pork, and processed meats. These outbreaks have led to significant public health and economic consequences, highlighting the importance of effective interventions to lower the risk of contamination **[109,110,111,112,113,114,115,116 and 117]**.

The Irradiation has been studied extensively for its efficacy in reducing the microbial contamination of the meat. The Exposure of the meat to ionizing radiation, the latter lowers or eliminates the harmful microorganisms that can cause food-borne diseases. Previous research showed that irradiation could effectively lower the levels of pathogens such as Salmonella and Escherichia coli as well as the levels of spoilage organisms, leading to improved microbial food safety and lower the risk of food borne diseases. The effectiveness of various types of ionizing radiation on the meat, including the gamma rays and the e-beams, has been studied **[82, 83, 84, 85, 86,87, 88, 89,90, and 91]**. Gamma-ray irradiation is more effective than e-beam irradiation at inhibiting microbial growth in the meat. The UV light effectively eliminates the Salmonella spp., the Pseudomonas, the Micrococcus, and the Staphylococcus on the meat. The shelf life of the meat products is extended by eliminating these contaminating bacteria. Gamma irradiation at low doses can improve microbiological food safety, ensure safety, and extend chicken meat's shelf life without affecting the food quality. 'Three kGy gamma irradiated beef lower the growth of the mesophilic bacteria, the coliforms, and the Staphylococcus aureus'. The Meat and Drug Administration (FDA) determined that a 3.5 kGy gamma ray irradiation dose effectively eliminates the pathogenic microorganisms from the fresh meat. The meat Irradiation had the action of slowing the growth of the bacterial cells and deactivating their metabolism. The Bacteria are inherently resistant to the action of the irradiation and, in the lag phase or inactive state will be more resistant. In contrast, those in the growth phase will be more vulnerable **[64,65,66,67,68,69,70,71 and 72]**.

### The Chemical Properties

The chemical properties of the irradiated meat refer to the changes that occur to the chemical constituents and compositions of the meat due to exposure to ionizing radiation. Irradiation can cause both desirable and undesirable action on the chemical characteristics of the meat, depending on the dose and the specific compounds in the meat. One of the most significant changes often observed in irradiated meat products is the formation of free radicals. They become reactive molecules that damage cellular components and cause oxidative stress. This leads to lipid oxidation, which causes off-flavors and odors, as well as a decline in nutritional quality due to the loss of essential fatty acids and other nutrients. The irradiation at the lower doses also aids lipid oxidation by reducing the levels of peroxides and other reactive species. This procedure also affects the protein content of the meat, leading to alterations in the composition of the amino acids, protein structure, and digestibility **[126,127, 128, 129, 130,131,132 and 133]**. These changes have potentially positive and negative actions, mostly on the nutritional value of

the meat, that are contingent upon the particular proteins involved and the dose of the radiation used. The positive action of irradiation includes the fact that the irradiation can cause the formation of reactive species, such as free radicals, which can cause the formation of covalent bonds between the amino acids in the protein molecules. This cross-linking can change the structure of a protein molecule and make it resistant to enzymatic digestion, which causes a decrease in protein digestibility **[27,28,29,30,31,32,33,34 35 and 36]**. Irradiation can also cause the denaturation of the protein molecules. Denaturation involves opening the protein structure, which can facilitate the interactions between the amino acids and increase the accessibility of the digestive enzymes to the protein molecules, and it can also improve protein digestibility. The irradiation can also cause adverse action; namely, excessive irradiation can cause a breakdown of or a change in the amino acid compounds in the protein molecules, which causes a decrease in the overall amino acid content and, consequently, decreases the protein digestibility. The electron-beam irradiation at less than 3 kGy did not affect changes in the quality of the smoked duck flesh the amino acids, the fatty acids, and the volatiles during the storage **[118,119,120,121,122,123,124 and 125]**.

Aside from these chemical changes, the irradiation also affects the vitamin content of the meat products, with some vitamins being more sensitive than others. The irradiation leads to a loss of the vitamin C, while other vitamins, such as vitamins A and E, are relatively stable. Irradiation has been shown to alter the meat's oxidation-reduction ability, accelerating lipid oxidation, protein breakdown, and flavor and odor changes **[147,148,149,150,151,152 and 153]**.

When combined with certain antioxidants, such as flavonoids, irradiation can help prolong the induction period of lipid oxidation. 'The storage of the irradiated meat at 5–10 C for one week almost did not change the meat pH, the meat texture, the total volatile base nitrogen, or the microbe number'. The higher dose of the UV irradiation increased 2-thiobarbituric acid content, decreased water-holding capacity, and decreased beef color intensity and tenderness. Two point five and 5 kGy gamma irradiation lowered the nitrite content in the chicken sausages and prevented oxidation when combined with the antioxidants. The titratable acidity and the acid value in the meat samples can be lowered by irradiation **[17,18,19,20,21,22,23,24,25 and 26]**.

## Conflicts of Interest

The author declares no conflicts of interest.

## Conclusion

'One promising method that might enhance the food safety and the food quality of the meat is meat irradiation'. According to a recent study, irradiation can preserve the nutritional value of meat products, decrease microbial contamination, and increase shelf life.
To overcome this issue, more study is necessary as the sensory characteristics can be adversely affected. It is also significant to remember that the labeling regulations for irradiated meat products exist and that irradiation in meat processing is governed by both national and international bodies. Government organizations play a crucial role in guaranteeing the security and quality of the customers.

## References


1. Shaltout, F, Riad, E.M, and AbouElhassan, Asmaa, A. (2017). prevalence Of Mycobacterium Tuberculosis In Imported cattle Offals And Its lymph Nodes. Veterinary Medical Journal -Giza (VMJG). 63(2): 115 -122.
2. Pereira, P.M.d.C.C, Vicente, A.F.d.R.B. (2013). Meat Nutritional Composition and Nutritive Role in the Human Diet. Meat Sci. 93(3): 586-592.
3. Shaltout, F, Riad, E.M, and Asmaa Abou-Elhassan. (2017). Prevalence Of Mycobacterium Spp. In Cattle Meat And Offal's Slaughtered In And Out Abattoir. Egyptian Veterinary medical Association. 77(2): 407 - 420.
4. Abd Elaziz, O, Fatin S. Hassanin, Fahim A, Shaltout and Othman A, Mohamed. (2021). Prevalence of Some Foodborne Parasitic Affection in Slaughtered Animals in Loacal Egyptian Abottoir. Journal of Nutrition Food Science and Technology.41(1):111-114.
5. Klurfeld, D.M. (2018). What Is the Role of Meat in a Healthy Diet? Anim. Front. 8, 5-10.
6. Abd Elaziz, O, Fatin, S Hassanin, Fahim, A Shaltout, Othman, A Mohamed. (2021). Prevalence of some zoonotic parasitic affections in sheep carcasses in a local abattoir in Cairo, Egypt. Advances in Nutrition & Food Science.4(1):111-114.
7. Al Shorman,A.A.M, Shaltout, F, and hilat,N. (1999). Detection of certain hormone residues in meat marketed in Jordan.Jordan University of Science and Technology, 1st International Conference on Sheep and goat Diseases and Productivity.1: 23-25.
8. Saucier, L. (2016). Microbial Spoilage, Quality and Safety within the Context of Meat Sustainability. Meat Sci. 120: 78-84.
9. Ebeed Saleh, Fahim Shaltout, Essam Abd Elaal. (2021). Effect of some organic acids on microbial quality of dressed cattle carcasses in Damietta abattoirs, Egypt. Damanhour Journal of Veterinary Sciences. 5(2): 17-20.
10. Edris A, Hassanin, F. S, Shaltout, F, Azza H Elbaba and Nairoz M Adel. (2017). Microbiological Evaluation of Some HeatTreated Fish Products in Egyptian Markets.EC Nutrition. 12(3): 134-142.
11. Bantawa, K, Rai, K, Subba Limbu, D, Khanal, H. (2018). Food-Borne Bacterial Pathogens in Marketed Raw Meat of Dharan, Eastern Nepal. BMC Res. Notes.11(1): 618.
12. Edris,A, Hassan,M.A, Shaltout, F, and Elhosseiny , S. (2013). Chemical evaluation of cattle and camel meat.BENHA VETERINARY MEDICAL JOURNAL. 25(2):145-150.
13. Edris,A.M, Hassan,M.A, Shaltout, F. and Elhosseiny ,S.(2013). Detection of E. coli and Salmonella organisms in cattle and camel meat. BENHA VETERINARY MEDICAL JOURNAL. 25(2): 198-204.
14. Madoroba, E, Magwedere, K, Chaora, N.S, Matle, I, Muchadeyi, F, Mathole, M.A, Pierneef, R. (2021). Microbial Communities of Meat and Meat Products: An Exploratory Analysis of the Product Quality and Safety at Selected Enterprises in South Africa. Microorganisms. 9(3): 507.
15. Edris A.M, Hemmat M. I, Shaltout, F, Elshater M.A, Eman F.M.I. (2012). STUDY ON INCIPIENT SPOILAGE OF CHILLED

CHICKEN CUTS-UP. BENHA VETERINARY MEDICAL JOURNAL. 23(1): 81-86.

**16.** Schevey, C.T, Toshkov, S, Brewer, M.S. (2013). Effect of Natural Antioxidants, Irradiation, and Cooking on Lipid Oxidation in Refrigerated, Salted Ground Beef Patties. J. Food Sci. 78(11):1793-1799.

**17.** Edris A.M, Hemmat M. I, Shaltout, F, Elshater M. A, Eman, F.M.I. (2012). CHEMICA ANALYSIS OF CHICKEN MEAT WITH RELATION TO ITS QUALITY. BENHA VETERINARY MEDICAL JOURNAL. 23(1): 87-93.

**18.** Edris, A.M, Shaltout, F, and Abd Allah, A.M. (2005). Incidence of Bacillus cereus in some meat products and the effect of cooking on its survival. Zag. Vet. 33 (2):118-124.

**19.** Chun, H.H, Kim, J.Y, Lee, B.D, Yu, D.J, Song, K.B. (2010). Effect of UV-C Irradiation on the Inactivation of Inoculated Pathogens and Quality of Chicken Breasts during Storage. Food Control. 21(3): 276-280.

**20.** Edris, A.M, Shaltout, F, and Arab, W.S. (2005). Bacterial Evaluation of Quail Meat. Benha Vet. Med. 16 (1):1-14.

**21.** Edris, A.M, Shaltout, F,Salem, G.H, and El-Toukhy,E.I. (2011). Incidence and isolation of Salmonellae from some meat products.Benha University ,Faculty of Veterinary Medicine , Fourth Scientific Conference 25-27th May 2011Veterinary Medicine and Food Safety ). 172-179 benha , Egypt.

**22.** Singh, R, Singh, A. (2019). Food Irradiation: An Established Food Processing Technology for Food Safety and Security. Def. Life Sci. 4(4): 206-213.

**23.** Edris AA, Hassanin, F. S, Shaltout, F, Azza H Elbaba and Nairoz M Adel. (2017). Microbiological Evaluation of Some Heat Treated Fish Products in Egyptian Markets. EC Nutrition. 12(3): 134-142.

**24.** Edris, A.M, Shaltout, F,Salem, G.H, and El-Toukhy,E.I. (2011). Plasmid profile analysis of Salmonellae isolated from some meat products. Benha University,Faculty of Veterinary Medicine , Fourth Scientific Conference 25-27th May 2011Veterinary Medicine and Food Safety ).194-200.

**25.** Amiri, A, Zandi, H, Khosravi, H.M. (2019). Effect of Electron Beam Irradiation on Survival of Escherichia Coli O157:H7 and Salmonella Enterica Serovar Thyphimurium in Minced Camel Meat during Refrigerated Storage. J. Food Qual. Hazards Control. 6: 174-178.

**26.** Ragab A, Abobakr M. Edris, Fahim A.E, Shaltout, Amani M. Salem. (2022). Effect of titanium dioxide nanoparticles and thyme essential oil on the quality of the chicken fillet. BENHA VETERINARY MEDICAL JOURNAL.41(2): 38-40.

**27.** Hassan, M.A, Shaltout, F, Arfa M.M, Mansour A.H and Saudi, K. R. (2013). BIOCHEMICAL STUDIES ON RABBIT MEAT RELATED TO SOME DISEASES. BENHA VETERINARY MEDICAL JOURNAL. 25(1): 88-93.

**28.** Farkas, J. (2006). Irradiation for Better Foods. Trends Food Sci. Technol. 17(4): 148-152.

**29.** Hassan, M.A and Shaltout, F. (1997). Occurrence of Some Food Poisoning Microorganisms In Rabbit Carcasses Alex.J.Vet.Science. 13(1): 55-62.

**30.** Hassan M, Shaltout FA and Saqur N. (2020). Histamine in Some Fish Products. Archives of Animal Husbandry & Dairy Science. 2(1): 1-3.

**31.** Hassan, M.A and Shaltout, F. (2004). Comparative Study on Storage Stability of Beef, Chicken meat, and Fish at Chilling Temperature. Alex.J.Vet.Science. 20(21): 21-30.

**32.** Bonomo, L. (2006). A Critical Analysis Risk Assessment: Food Irradiation: Pro or Con? ESSAI. 4, 8.

**33.** Hassan, M.A, Shaltout, F, Arafa, M.M, Mansour, A.H, and Saudi, K.R. (2013). Biochemical studies on rabbit meat related to some diseases.Benha Vet. Med.J.25 (1):88-93.

**34.** Hassan, M.A, Shaltout, F, Maarouf, A.A, and El-Shafey, W.S. (2014). Psychrotrophic bacteria in frozen fish with special reference to pseudomonas species.Benha Vet. Med.J. 27 (1): 78-83.

**35.** Hassan, M.A, Shaltout, F, Arafa,M.M, Mansour , A.H, and Saudi , K.R. (2013). Bacteriological studies on rabbit meat related to some diseases Benha Vet. Med.J. 25 (1):94-99.

**36.** Hassanin, F. S, Hassan,M.A, Shaltout, F , Nahla A. Shawqy and 2Ghada A, Abd-Elhameed. (2017). Chemical criteria of chicken meat.BENHA VETERINARY MEDICAL JOURNAL. 33(2): 457-464.

**37.** Hassanin, F. S, Hassan,M.A, Shaltout, F, and Elrais-Amina, M. (2014). CLOSTRIDIUM PERFRINGENS IN VACUUM PACKAGED MEAT PRODUCTS. BENHA VETERINARY MEDICAL JOURNAL. 26(1): 49-53.

**38.** Hassanien, F.S, Shaltout, F,Fahmey, M.Z, and Elsukkary, H.F. (2020). Bacteriological quality guides in local and imported beef and their relation to public health. Benha Veterinary Medical Journal. 39(1): 125-129.

**39.** Munir, M.T, Federighi, M. (2020). Control of Foodborne Biological Hazards by Ionizing Radiations. Foods. 9(7): 878.

**40.** Hassanin, F. S,Shaltout,F, and , Mostafa E.M. (2013). Parasitic affections in edible offal. Benha Vet. Med.J. 25 (2):46-55.

**41.** Hassanin, F. S, Shaltout, F, Lamada, H.M, Abd Allah, E.M. (2011). THE EFFECT OF PRESERVATIVE (NISIN) ON THE SURVIVAL OF LISTERIA MONOCYTOGENES. BENHA VETERINARY MEDICAL JOURNAL (2011). 141-145.

**42.** Ham, Y.K, Kim, H.W, Hwang, K.E, Song, D.H, Kim, Y.J, Choi, Y.S, Song, B.S, Park, J.H, Kim, C.J. (2017). Effects of Irradiation Source and Dose Level on Quality Characteristics of Processed Meat Products. Radiat. Phys. Chem. 130: 259-264.

**43.** Khattab, E, Fahim Shaltout and Islam Sabik. (2021). Hepatitis A virus related to foods. BENHA VETERINARY MEDICAL JOURNAL. 40(1): 174-179.

**44.** Saad M. Saad, Fahim A. Shaltout, Amal A. A, Farag Hashim F, Mohammed. (2022). Organophosphorus Residues in Fish in Rural Areas. Journal of Progress in Engineering and Physical Science. 1(1): 27-31.

**45.** Saif,M , Saad S.M , Hassanin, F. S, Shaltout, F , Marionette Zaghloul. (2019). Molecular detection of enterotoxigenic Staphylococcus aureus in ready-to-eat beef products. Benha Veterinary Medical Journal. 37(1): 7-11.

**46.** Saif,M , Saad S.M , Hassanin, F. S, Shaltout, F , Marionette Zaghlou. (2019). Prevalence of methicillin-resistant Staphylococcus aureus in some ready-to-eat meat products. Benha Veterinary Medical Journal. 37(1): 12-15.

**47.** Farag, A. A, Saad M. Saad[1], Fahim A. Shaltout1, Hashim F. Mohammed. (2023). Studies on Pesticides Residues in Fish in Menofia Governorate. Benha Journal of Applied Sciences. 8(5): 323-330.

**48.** C Reygaert,W. (2018). An Overview of the Antimicrobial Resistance Mechanisms of Bacteria. AIMS Microbiol. 4(3): 482–501.

**49.** Farag, A. A, Saad M. Saad[1], Fahim A. Shaltout1, Hashim F. Mohammed. (2023). Organochlorine Residues in Fish in Rural Areas. Benha Journal of Applied Sciences. 8 (5): 331-336.

**50.** Shaltout, F, Mona N. Hussein, Nada Kh. Elsayed. (2023). Histological Detection of Unauthorized Herbal and Animal Contents in Some Meat Products. Journal of Advanced Veterinary Research. 13(2): 157-160.

**51.** Yemmireddy, V, Adhikari, A, Moreira, J. (2022). Effect of Ultraviolet Light Treatment on Microbiological Safety and Quality of Fresh Produce: An Overview. Front. Nutr. 9:871243.

**52.** Shaltout, F, Heikal, G. I, Ghanem, A. M. (2022). Mycological quality of some chicken meat cuts in Gharbiya governorate with special reference to Aspergillus flavus virulent factors. benha veteriv medical journal veterinary. 42(1): 12-16.

**53.** Shaltout, F, Ramadan M. Salem, Eman M. Eldiasty, Fatma A. Diab. (2022). Seasonal Impact on the Prevalence of Yeast Contamination of Chicken Meat Products and Edible Giblets. Journal of Advanced Veterinary Research. 12(5): 641-644.

**54.** Shaltout, F, Abdelazez Ahmed Helmy Barr and Mohamed Elsayed Abdelaziz. (2022). Pathogenic Microorganisms in Meat Products. Biomedical Journal of Scientific & Technical Research. 41(4): 32836-32843.

**55.** Shaltout, F, Thabet, M.G. and Koura, H.A. (2017). Impact of Some Essential Oils on the Quality Aspect and Shelf Life of Meat. J Nutr Food Sci. 33(2):351-364.

**56.** Ehlermann, D.A.E. (2014). Safety of Food and Beverages: Safety of Irradiated Foods. In Encyclopedia of Food Safety; Motarjemi, Y.B.T, Ed. Academic Press: Waltham, MA, USA. 3: 447-452.

**57.** Shaltout, F, Islam Z. Mohammed[2], El -Sayed A. Afify. (2020). Bacteriological profile of some raw chicken meat cuts in Ismailia city, Egypt.Benha Veterinary Medical Journal. 39: 11-15.

**58.** Shaltout, F, Islam, Z. Mohammed[2], El -Sayed A. Afify. (2020). Detection of E. coli O157 and Salmonella species in some raw chicken meat cuts in Ismailia province, Egypt. Benha Veterinary Medical Journal. 39: 101-104.

**59.** Lianou, A, Panagou, E.Z, Nychas, G.J.E. (2017). Meat Safety-I Foodborne Pathogens and Other Biological Issues. In Lawrie's Meat Science: Eighth Edition; Toldra´, F, Ed.Woodhead Publishing: Cambridge, UK. 521–552.

**60.** Shaltout, F, E.M, El-diasty and M. A. Asmaa- Hassan. (2020). HYGIENIC QUALITY OF READY TO EAT COOKED MEAT IN RESTAURANTS AT Cairo. Journal of Global Biosciences. 8(12): 6627-6641.

**61.** Shaltout, F, Marrionet Z. Nasief, L. M. Lotfy, Bossi T. Gamil. (2019). Microbiological status of chicken cuts and its products. Benha Veterinary Medical Journal. 37: 57-63.

**62.** Shaltout, F. (2019). Poultry Meat. Scholarly Journal of Food and Nutrition. 22: 1-2.

**63.** Marin, C, Cerdà-Cuéllar, M, González-Bodi, S, Lorenzo-Rebenaque, L, Vega, S. (2022). Research Note: Persistent Salmonella Problem in Slaughterhouses Related to Clones Linked to Poultry Companies. Poult. Sci. 101(8): 101968.

**64.** Shaltout, F. (2019). Food Hygiene and Control. Food Science and Nutrition Technology. 4(5): 1-2.

**65.** Hassanin, F. S, Shaltout, F, Seham N. Homouda and Safaa M. Arakeeb. (2019). Natural preservatives in raw chicken meat. Benha Veterinary Medical Journal. 37: 41-45.

**66.** Hazaa,W, Shaltout, F, Mohamed El-Shate. (2019). Prevalence of some chemical hazards in some meat products. Benha Veterinary Medical. 37 (1): 32-36.

**67.** Park, J.G, Yoon, Y, Park, J.N, Han, I.J, Song, B.S, Kim, J.H, Kim, W.G, Hwang, H.J, Han, S.B, Lee, J.W. (2010). Effects of Gamma Irradiation and Electron Beam Irradiation on Quality, Sensory, and Bacterial Populations in Beef Sausage Patties. Meat Sci. 85(2): 368–372.

**68.** Hazaa,W, Shaltout, F, Mohamed El-Shater. (2019). Identification of Some Biological Hazards in Some Meat Products. Benha Veterinary Medical Journal. 37 (1) 27-31.

**69.** Indiarto, R, Pratama, A.W, Sari, T.I, Theodora, H.C. (2020). Food Irradiation Technology: A Review of the Uses and Their Capabilities. SSRG Int. J. Eng. Trends Technol. 68(12): 91-98.

**70.** Gaafar,R, Hassanin, F. S, Shaltout, F, Marionette Zaghloul. (2019). Molecular detection of enterotoxigenic Staphylococcus aureus in some ready to eat meat-based sandwiches. Benha Veterinary Medical Journal. 37 (1): 22-26.

**71.** Gaafar,R, Hassanin, F. S, Shaltout, F, Marionette Zaghloul. (2019). Hygienic profile of some ready to eat meat product sandwiches sold in Benha city, Qalubiya Governorate, Egypt. Benha Veterinary Medical Journal. 37 (1): 16-21.

**72.** Indiarto, R, Qonit, M.A.H. (2020). A Review of Irradiation Technologies on Food and Agricultural Products. Int. J. Sci. Technol. Res. 9(1): 4411-4414.

**73.** Saad S.M, Shaltout, F, Nahla A Abou Elroos, Saber B El-nahas. (2019). Antimicrobial Effect of Some Essential Oils on Some Pathogenic Bacteria in Minced Meat. J Food Sci Nutr Res. 2 (1): 012-020.

**74.** Saad S.M, Shaltout, F, Nahla A Abou Elroos2 and Saber B El-nahas. (2019). Incidence of Staphylococci and E. coli in Meat and Some Meat Products. EC Nutrition. 14.6.

**75.** D'Souza, C, Apaolaza, V, Hartmann, P, Brouwer, A.R, Nguyen, N. (2021). Consumer Acceptance of Irradiated Food and Information Disclosure-A Retail Imperative. J. Retail. Consum. Serv. 63(4): 102699.

**76.** Saad S.M, Hassanin, F. S, Shaltout, F, Marionette Z Nassif, Marwa Z Seif. (2019). Prevalence of Methicillin-Resistant Staphylococcus Aureus in Some Ready-to-Eat Meat Products. American Journal of Biomedical Science & Research. 4(6):460-464.

**77.** Shaltout, F. (2019). Pollution of Chicken Meat and Its Products by Heavy Metals. Research and Reviews on Healthcare: Open Access Journal. 4(3): (381-3382).

**78.** Putri, M.S, Susanna, D. (2021). Food Safety Knowledge, Attitudes, and Practices of Food Handlers at Kitchen Premises in the Port 'X' Area, North Jakarta, Indonesia 2018. Ital. J. Food Saf. 10(4): 9215.

**79.** Shaltout, F. A, E.M EL-diasty, M. S. M Mohamed. (2018). Effects of chitosan on quality attributes fresh meat slices stored at 4 C. BENHA VETERINARY MEDICAL JOURNAL. 35(2): 157-168.

**80.** Shaltout, F, and Adel-Aziz. (2004). Salmonella enterica serovar Enteritidis in poultry meat and their epidemiology. Vet. Med. J. Giza. 52(3): 429-436.

**81.** Shaltout, F, Hala F El-Shorah, Dina I El Zahaby, Lamiaa M Lotfy. (2018). Bacteriological Profile of Chicken Meat Products. SciFed Food & Dairy Technology Journal.1(3):83-90.

**82.** Otoo, E.A, Ocloo, F.C.K, Appiah, V. (2022). Effect of Gamma Irradiation on Shelf Life of Smoked Guinea Fowl (Numida Meleagris) Meat Stored at Refrigeration Temperature. Radiat. Phys. Chem. 194(4): 110041.

**83.** Shaltout, F, Mohamed, A.H. El-Shater, Wafaa Mohamed Abd El-Aziz. (2015). Bacteriological assessment of Street Vended Meat Products sandwiches in kalyobia Governorate. BENHA VETERINARY MEDICAL JOURNAL. 28(2): 58-66.

**84.** Sedeh, F.M, Arbabi, K, Fatolahi, H, Abhari, M. (2007). Using Gamma Irradiation and Low Temperature on Microbial Decontamination of Red Meat in Iran. Indian J. Microbiol. 47(1): 72-76.

**85.** Shaltout, F, Mohamed A El shatter and Heba M Fahim. (2019). Studies on Antibiotic Residues in Beef and Effect of Cooking and Freezing on Antibiotic Residues Beef Samples. Scholarly Journal of Food and Nutritionm. 2(1): 1-4.

**86.** Shaltout, F, Zakaria IM and Nabil ME. (2018). Incidence of Some Anaerobic Bacteria Isolated from Chicken Meat Products with Special Reference to Clostridium perfringens. Nutrition and Food Toxicology. 2(5): 429-438.

**87.** Gunes, G, Deniz Tekin, M. (2006). Consumer Awareness and Acceptance of Irradiated Foods: Results of a Survey Conducted on Turkish Consumers. LWT. 39(4): 444-448.

**88.** Shaltout, F, Ahmed A A Maarouf and Mahmoud ES Elkhouly. (2017). Bacteriological Evaluation of Frozen Sausage. Nutrition and Food Toxicology. 1(5): 174-185.

**89.** Rastogi, R.P, Richa, Kumar, A, Tyagi, M.B, Sinha, R.P. (2010). Molecular Mechanisms of Ultraviolet Radiation-Induced DNA Damage and Repair. J. Nucleic Acids. 592980.

**90.** Shaltout, F, El-Toukhy EI and Abd El-Hai MM. (2019). Molecular Diagnosis of Salmonellae in Frozen Meat and Some Meat Products. Nutrition and Food Technology Open Access. 5(1): 1-6.

**91.** Shaltout, F, A.M.Ali and S.M.Rashad. (2016). Bacterial Contamination of Fast Foods. Benha Journal of Applied Sciences (BJAS). 1(2): 45-51.

**92.** Shaltout, F, Zakaria. I. M, Jehan Eltanani, Asmaa, Elmelegy. (2015). Microbiological status of meat and chicken received to University student hostel. BENHA VETERINARY MEDICAL JOURNAL. 29(2): 187-192.

**93.** Monteiro, M.L.G, Mársico, E.T, Mano, S.B, Teixeira, C.E, Canto, A.C.V.d.C.S, Carvalho Vital, H, Conte-Júnior, C.A. (2013). Influence of Good Manufacturing Practices on the Shelf Life of Refrigerated Fillets of Tilapia (Oreochromis Niloticus) Packed in Modified Atmosphere and Gamma-irradiated. Food Sci. Nutr. 1(4): 298-306.

**94.** Saad,S.M,Edris, A.M, Shaltout, F, and Edris, Shimaa. (2012). Isolation and identification of salmonellae and E. coli from meat and poultry cuts by using A.multiplex PCR. Benha Vet. Med.J.special issue. 16-26.

**95.** Saad, S.M, and Shaltout, F. (1998). Mycological Evaluation of camel carcasses at Kalyobia Abattoirs. Vet.Med.J. Giza. 46(3): 223-229.

**96.** Hassanzadeh, P, Tajik, H, Rohani, S.M.R, Moradi, M, Hashemi, M, Aliakbarlu, J. (2017). Effect of Functional Chitosan Coating and Gamma Irradiation on the Shelf-Life of Chicken Meat during Refrigerated Storage. Radiat. Phys. Chem. 141: 103–109.

**97.** Saad S.M, Shaltout, F, Nahla A Abou Elroos, Saber B El-nahas. (2019). Antimicrobial Effect of Some Essential Oils on Some Pathogenic Bacteria in Minced Meat. J Food Sci Nutr Res. 2(1): 012-020.

**98.** Saad S.M, Hassanin, F. S, Shaltout, F, Marionette Z Nassif, Marwa Z Seif. (2019). Prevalence of Methicillin-Resistant Staphylococcus Aureus in Some Ready-to-Eat Meat Products. American Journal of Biomedical Science & Research. 4(6): 460-464.

**99.** Castell-Perez, M.E, Moreira, R.G. (2021). Irradiation and Consumers Acceptance. Innov. Food Process. Technol. A Compr. Rev. 2: 122–135.

**100.** S.M, Shaltout, F, Nahla A Abou Elroos and Saber B El-nahas. (2019). Incidence of Staphylococci and E. coli in Meat and Some Meat Products. EC Nutrition. 14.6.

**101.** Shaltout, F, Riad EM, TES Ahmed and AbouElhassan A. (2017). Studying the Effect of Gamma Irradiation on Bovine Offal's Infected with Mycobacterium tuberculosis Bovine Type. Journal of Food Biotechnology Research. 1(6): 1-5.

**102.** Maherani, B, Hossain, F, Criado, P, Ben-Fadhel, Y, Salmieri, S, Lacroix, M. (2016). World Market Development and Consumer Acceptance of Irradiation Technology. Foods. 5(4): 79.

**103.** Shaltout, F, Ahmed A A Maarouf and Mahmoud ES Elkhouly. (2017). Bacteriological Evaluation of Frozen Sausage. Nutrition and Food Toxicology. 1(5): 174-185.

**104.** Shaltout, F, Zakaria IM and Nabil ME. (2018). Incidence of Some Anaerobic Bacteria Isolated from Chicken Meat Products with Special Reference to Clostridium perfringens. Nutrition and Food Toxicology. 2(5): 429-438.

**105.** Shaltout, F, Mohamed, A.Hassan and Hassanin, F.S. (2004). THERMAL INACTIVATION OF ENTEROHAEMORRHAGIC

ESCHERICHIA COLI O157:H7 AND ITS SENSTIVITY TO NISIN AND LACTIC ACID CULTURES. 1rst Ann. Confr, FVM, Moshtohor.1:336-344.

**106.** Arvanitoyannis, I.S. (2010). Consumer Behavior toward Irradiated Food. In Irradiation of Food Commodities: Techniques, Applications, Detection, Legislation, Safety and Consumer Opinion; Arvanitoyannis, I.S.B.T.-I., Ed.; Academic Press: Boston, MA, USA. 673–698.

**107.** Shaltout, F, El-diasty, E,M,Elmesalamy, M. and Elshaer, M. (2014). Study on fungal contamination of some chicken meat products with special reference to 2 the use of PCR for its identification. Conference,Veterinary Medical Journal – Giza. 60: 1-10.

**108.** shaltout, F. (2002). Microbiological Aspects of Semi-cooked chicken Meat Products. Benha Veterinary Medical Journal.13(2): 15-26.

**109.** Morrison, R.M. (1990). Economics of Food Irradiation: Comparison between Electron Accelerators and Cobalt-60. Int. J. Radiat. Appl. Instrum. Part. 35: 673-679.

**110.** Shaltout, F, Thabet, M.G2 and Hanan, A. Koura3. (2017). Impact of some essential oils on the quality aspect and shelf life of meat.BENHA VETERINARY MEDICAL JOURNAL. 33(2): 351-364.

**111.** Erkmen, O, Bozoglu, T.F. (2016). Food Preservation by Irradiation. In Food Microbiology: Principles into Practice; John Wiley & Sons, Ltd.: Hoboken, NJ, USA. 106-126.

**112.** Shaltout F, Mohammed Farouk; Hosam A.A. Ibrahim and Mostafa E.M. Afifi4. (2017). Incidence of Coliform and Staphylococcus aureus in ready to eat fast foods. BENHA VETERINARY MEDICAL JOURNAL. 32(1): 13 - 17.

**113.** Shaltout, F, Zakaria, I.M, Nabil, M.E. (2017). Detection and typing of Clostridium perfringens in some retail chicken meat products.BENHA VETERINARY MEDICAL JOURNAL. 33(2): 283-291.

**114.** Food and Drug Administration; HHS. (2012). Irradiation in the Production, Processing and Handling of Food. Final Rule. Fed. Regist. 77(231): 71316–71320.

**115.** Shaltout, F. (1992). Studies on Mycotoxins in Meat and Meat by Products. M.V.Sc Thesis Faculty of Veterinary Medicine,Moshtohor,Zagazig University Benha branch.

**116.** Shaltout, F. (1996). Mycological And Mycotoxicological profile Of Some Meat products. Ph.D.Thesis, Faculty of Veterinary Medicine,Moshtohor, Zagazig University Benha branch.

**117.** Shaltout, F. (1998). Proteolytic Psychrotrophes in Some Meat products. Alex. Vet. Med. J.14 (2): 97-107.

**118.** Shaltout, F. (1999). Anaerobic Bacteria in Vacuum Packed Meat Products. Benha Vet. Med.J.10 (1): 1-10.

**119.** Fajardo-Guerrero, M, Rojas-Quintero, C, Chamorro-Tobar, I, Zambrano, C, Sampedro, F, Carrascal-Camacho, A.K. (2020). Exposure Assessment of Salmonella Spp. in Fresh Pork Meat from Two Abattoirs in Colombia. Food Sci. Technol. Int. 26(1): 21–27.

**120.** Shaltout, F. (2000). Protozoal Foodborne Pathogens in some Meat Products. Assiut Vet. Med. J. 42(84): 54-59.

**121.** Shaltout, F. (2001). Quality evaluation of sheep carcasses slaughtered at Kalyobia abattoirs. Assiut Veterinary Medical Journal. 46(91):150-159.

**122.** Shahi, S, Khorvash, R, Goli, M, Ranjbaran, S.M, Najarian, A, Mohammadi Nafchi, A. (2021). Review of Proposed Different Irradiation Methods to Inactivate Food-Processing Viruses and Microorganisms. Food Sci. Nutr. 9(10): 5883–5896.

**123.** Shaltout, F. (2002). Microbiological Aspects of Semi-cooked Chicken Meat Products. Benha Vet.Med.J. 13(2): 15-26.

**124.** Mkhungo, M.C, Oyedeji, A.B, Ijabadeniyi, O.A. (2018). Food Safety Knowledge and Microbiological Hygiene of Households in Selected Areas of Kwa-Zulu Natal, South Africa. Ital. J. Food Saf. 7: 126–130.

**125.** Shaltout, F. (2003). Yersinia Enterocolitica in some meat products and fish marketed at Benha city.The Third international conference Mansoura 29-30 April.

**126.** Shaltout, F. (2009). Microbiological quality of chicken carcasses at modern Poultry plant. The 3rd Scientific Conference,Faculty of Vet. Med, Benha University. 1-3 january.

**127.** Shaltout, F. and Abdel Aziz,A.M. (2004). Salmonella enterica Serovar Enteritidis in Poultry Meat and their Epidemiolog Vet.Med.J,Giza. 52(3): 429-436.

**128.** Song, B.S, Lee, Y, Park, J.H, Kim, J.K, Park, H.Y, Kim, D.H, Kim, C.J, Kang, I.J. (2018). Toxicological and Radiological Safety of Chicken Meat Irradiated with 7.5 MeV X-rays. Radiat. Phys. Chem. 144: 211–217.

**129.** Shaltout, F. and Abdel Aziz,A.M. (2004). ESCHERICHIA COLI STRAINS IN SLAUGHTERED ANIMALS AND THEIR PUBLIC HEALTH IMPORTENCE . J.Egypt. Vet. Med. Association. 64(2): 7-21.

**130.** Shaltout, F, Amin, R, Marionet, Z, Nassif and Shimaa, Abdel-wahab. (2014). Detection of aflatoxins in some meat products. Benha veterinary medical journal. 27(2): 368-374.

**131.** Bintsis, T. (2017). Foodborne Pathogens. AIMS Microbiol. 3(3): 529-563.

**132.** Shaltout, F. and Afify, Jehan Riad,EM and Abo Elhasan , Asmaa,A. (2012). Improvement of microbiological status of oriental sausage. Journal of Egyptian Veterinary Medical Association. 72(2): 157-167.

**133.** Shaltout, F. and Daoud, J. R. (1996). Chemical analytical studies on rabbit meat and liver. Benha Vet. Med.J. 7(2): 55-64.

**134.** Shaltout, F. and Edris, A.M. (1999). Contamination of shawerma with pathogenic yeasts. Assiut Veterinary Medical Journal. 40(64): 34-39.

**135.** Oh, H, Yoon, Y, Yoon, J.W, Oh, S.W, Lee, S, Lee, H. (2023). Salmonella Risk Assessment in Poultry Meat from Farm to Consumer in Korea. Foods. 12(3): 649.

**136.** Shaltout, F, Eldiasty, E, and Mohamed, M.S. (2014). Incidence of lipolytic and proteolytic fungi in some chicken meat products and their public health significance. Animal Health

Research Institute: First International Conference on Food Safety and Technology 19-23 Cairo Egypt. 79-89.

**137.** Ehlermann, D.A.E. (2016). Particular Applications of Food Irradiation: Meat, Fish and Others. Radiat. Phys. Chem. 129: 53-57.

**138.** Shaltout, F,Eldiasty, E, Salem, R, and Hassan, Asmaa. (2016). Mycological quality of chicken carcasses and extending shelf – life by using preservatives at refrigerated storage. Veterinary Medical Journal -Giza (VMJG).62(3): 1-7.

**139.** Shaltout, F, Salem, R. Eldiasty, E, and Diab, Fatema. (2016). Mycological evaluation of some ready to eat meat products with special reference to molecular chacterization. Veterinary Medical Journal -Giza. 62(3): 9-14.

**140.** Farkas, J, Mohácsi-Farkas, C. (2011). History and Future of Food Irradiation. Trends Food Sci. Technol. 22(2-3): 121–126.

**141.** Shaltout, F, Elshater, M, and Wafaa, Abdelaziz. (2015). Bacteriological assessment of street vended meat products sandwiches in Kalyobia Governorate. Benha Vet. Med.J. 28(2): 58-66.

**142.** Shaltout, F, Gerges, M.T, and Shewail, A.A. (2018). Impact of Organic Acids and Their Salts on Microbial Quality and Shelf Life of Beef. Assiut veterinary medical journal. 64(159): 164-177.

**143.** Da Vinha, A.C.M.F, Sousa e Silva, C.A.d.A. (2022). Overview of Irradiation: Advantages to Foods of Plant Origin. South Florida J. Health. 3(3): 248-262.

**144.** Shaltout, F,Ghoneim, A.M, Essmail, M.E, and Yousseif ,A. (2001). Studies on aflatoxin B1 residues in rabbits and their pathological effects. J.Egypt. Vet. Med. Association. 61(2): 85-103.

**145.** Ahn, D.U, Kim, I.S, Lee, E.J. (2013). Irradiation and Additive Combinations on the Pathogen Reduction and Quality of Poultry Meat. Poult. Sci. 92(2): 534-545.

**146.** Shaltout, F. and Hanan, M.T. El-Lawendy. (2003). Heavy Metal Residues In Shawerma. Beni-Suef Vet.Med.J. 13(1): 213-224.

**147.** Shaltout, F. and Hashim, M.F. (2002). Histamine in salted, Smoked and Canned Fish products. Benha Vet. Med.J. 13(1): 1-11.

**148.** Yeh, Y, de Moura, F.H, Van Den Broek, K, de Mello, A.S. (2018). Effect of Ultraviolet Light, Organic Acids, and Bacteriophage on Salmonella Populations in Ground Beef. Meat Sci. 139: 44-48.

**149.** Shaltout, F, Hashim,M.F, and Elnahas,s. (2015). Levels of some heavy metals in fish (tilapia nilotica and Claris lazera) at Menufia Governorate. Benha Vet. Med.J. 29 (1): 56-64.

**150.** Shaltout, F. and Ibrahim, H.M. (1997). Quality evaluation of luncheon and Alexandrian sausage. Benha Vet. Med.J. 10(1): 1-10.

**151.** Gómez, I, Janardhanan, R, Ibañez, F.C, Beriain, M.J. (2020). The Effects of Processing and Preservation Technologies on Meat Quality: Sensory and Nutritional Aspects. Foods. 9(10): 1416.

**152.** Shaltout, F,Nassif, M and Shakran , A. (2014). Quality of battered and breaded chicken meat products. Global Journal of Agriculture and Food Safety Science. 1(2): 283-299.

**153.** Shaltout, F, Amani M. Salem, A. H. Mahmoud, K. A. (2013). Bacterial aspect of cooked meat and offal at street vendors level. Benha veterinary medical journal. 24(1): 320-328.

**154.** Shaltout, F, and Salem, R.M. (2000). Moulds, aflatoxin B1 and Ochratoxin A in Frozen Livers and meat products.Vet . Med. J.Giza. 48(3): 341-346.

**155.** Nam, K.C, Jo, C, Ahn, D.U. (2016). Irradiation of Meat and Meat Products. In Emerging Technologies in Meat Processing: Production, Processing and Technology; JohnWiley & Sons, Ltd.: Hoboken, NJ, USA. 7-36.

**156.** Yasser H, Al-Tarazi, A. Al-Zamil, Shaltout, F, and H. Abdel-Samei. (2002). Microbiological status of raw cow milk marketed in northern Jordan. AVMJ.49(96): 180-194.

**157.** Shaltout, F, Zakaria IM and Nabil ME. (2018). Incidence of Some Anaerobic Bacteria Isolated from Chicken Meat Products with Special Reference to Clostridium perfringens. Nutrition and Food Toxicology.2(5): 429-438.

**158.** Shaltout, F, El-diasty, E.M, and Mohamed, M. S. (2014). Incidence of lipolytic and proteolytic fungi in some chicken meat products and their public health significance. 1st Scientific conference of food safety and Technology. 79-89.

**159.** Shaltout, F, El-diasty, E.M, Salem, R. M. and Asmaa, M. A. Hassan. (2016). Mycological quality of chicken carcasses and extending shelf -life by using preservatives at refrigerated storage. Veterinary Medical Journal – Giza. 62(3): 1-10.

**160.** Borrego-Soto, G, Ortiz-López, R, Rojas-Martínez, A. (2015). Ionizing Radiation-Induced DNA Injury and Damage Detection in Patients with Breast Cancer. Genet. Mol. Biol. 38(4): 420-432.

**161.** Shaltout, F, R.M. Salem, E.M. El-Diasty and W.I.M. Hassan. (2019). Effect of Lemon Fruits and Turmeric Extracts on Fungal Pathogens in Refrigerated Chicken Fillet Meat. Global Veterinaria. 21(3): 156-160.

**162.** Shaltout, F, El-diasty, E, M, Elmesalamy, M, and Elshaer, M. (2014). Study on fungal contamination of some chicken meat products with special reference to 2 the use of PCR for its identification. Conference, Veterinary Medical Journal – Giza. 60: 1-10.

**163.** Shaltout, F, Salem, R. M, El-diasty, Eman and Fatema, A.H. Diab. (2016). Mycological evaluation of some ready to eat meat products with special reference to molecular characterization. Veterinary Medical Journal – Giza. 62(3): 9-14.

**164.** Lima, F, Vieira, K, Santos, M, de Souza, P.M. (2018). Effects of Radiation Technologies on Food Nutritional Quality; IntechOpen: London, UK. 137-146.

**165.** Shaltout, F, Ahmed, A.A. Maarouf, Eman, M.K. Ahmed. (2018). Heavy Metal Residues in chicken cuts up and processed chicken meat products. BENHA VETERINARY MEDICAL JOURNAL. 34(1): 473-483.

**166.** Shaltout,F, Hanan M. Lamada, Ehsan A.M. Edris. (2020). Bacteriological examination of some ready to eat meat and chicken meals. Biomed J Sci & Tech Res. 27(1): 20461-20465.

**167.** Sobhy, Asmaa and Shaltout, Fahim. (2020). Prevalence of some food poisoning bacteria in semi cooked chicken meat products at Qaliubiya governorate by recent Vitek 2 compact and PCR techniques. Benha Veterinary Medical Journal. 38(2): 88-92.

**168.** European Food Safety Authority. (2011). Scientific Opinion on the Efficacy and Microbiological Safety of Irradiation of Food. EFSA J. 9(4): 2103.

**169.** Sobhy, Asmaa and Shaltout, Fahim. (2020). Detection of food poisoning bacteria in some semi-cooked chicken meat products marketed at Qaliubiya governorate. Benha Veterinary Medical Journal. 38(2): 93-96.

**170.** Shaltout, F.A. (2024). Abattoir And Bovine Tuberculosis as A Reemerging Foodborne Diseas. Clinical Medical Reviews and Report. 6(1): 1-7.

**171.** Shaltout, F.A. (2023). Viruses in Beef, Mutton, Chevon, Venison, Fish and Poultry Meat Products. Food Science & Nutrition Technology. 8(4):1-10.