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Review Article

Just Let Us Know What We Are Doing for The Meat Safety and Hygiene in Butcheries and Supermarkets in Our Way

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Received Date: February 26, 2025| Accepted Date: March 10, 2025| Published Date: March 25, 2025

Citation: Fahim A. Shaltout, (2025), Just Let Us Know What We Are Doing for The Meat Safety and Hygiene in Butcheries and Supermarkets in Our Way, *Biomedical Research and Clinical Trials,* 4(2); **DOI:**10.31579/2835-7949/032

Abstract

Good hygienic practices are required to reduce the risk of microbial contamination during meat processing. We evaluated good hygiene and meat safety practices among different butcheries, commercial butcheries, and supermarkets through direct personal observations. The supermarkets and commercial butcheries wore personal protective equipment (PPE) and used proper waste procedures. Moreover, there were pest control devices, a safe water supply, and staff handling money away from meat. At butcheries, wearing hairnets and aprons, and the display of raw meat being separate from offal were identified as good practices. The irregular washing of hands, less use of gloves, wearing of open sandals and jewelry, use of the same coat for different activities, lack of paper towels and pest control devices and mismanagement of waste were practices that led to unsafe meat handling. Our study identified good meat safety practices at supermarkets. A combination of good and unhygienic meat handling practices was identified at commercial and butcheries. Training for food safety in order to improve the hygienic practices of meat handling along the beef supply chain, more especially in commercial and butcheries.

Keywords: food safety; good hygienic practices; supermarkets; commercial butcheries; pest control

Introduction

The increased demand for foods of animal origin is often linked to the world's growing human population. Consequently, meat producers, processors, and consumers give higher importance to meat safety. The main source of protein, vitamins, and nutrients for the development and functioning of body cells is meat (1,2,3,4,5,6 and 7). Worldwide, foodborne diseases are associated with the consumption of spoiled foods, which may occur during processing, among which meat processing has been attributed as a primary source of diseases when contaminated (8,9,10,11,12,13 and 14). Foodborne diseases are prevalent in developing countries in the world due to poor food handling and sanitation practices, insufficient laws for food hygiene, weak regulatory systems, lack of funding for the purchase of the necessary equipment, and a lack of food-handler education (15,16,17,18,19,20 and 21). The main source of foodborne diseases is through ingestion of meat contaminated by pathogenic bacteria such as Staphylococcus aureus, Salmonella species, Listeria monocytogenes, Escherichia coli 0157:H7 and Campylobacter species. Meat that is improperly handled may result in meat contaminated by pathogenic bacteria and can lead to health hazards for the consumer (22,23,24,25,26, 27 and 28). Butcheries have important role in the prevention of meat-borne diseases because of the high chances of meat contamination at the butchery level. Practice and maintenance of proper hygiene during meat handling is necessary for the provision of healthy and fresh meat for human consumption (29,30,31,32,33, 34 and 35). Often, meat handlers' poor personal hygiene operates as a vector for the spread of microbes through their hands, wounds, lips, skins, and hair. If proper sanitation and hygiene procedures, such as washing hands, wearing protective clothes, cleaning and sanitizing butchery equipment and utensils, are not followed, bacterial contamination, meat loss, and post-harvest meat shortages arise (36,37,38,39,40,41 and 42). The bacterial load in the meat, meat contact surfaces and utensils from the butcheries taken through swabs was higher than what was considered acceptable. The wholesomeness of meat is a shared responsibility for all individuals in the food chain. To correct the errors from farm to fork, there is a deep need of education and training in the prevention of foodborne diseases among abattoir workers, butchery, meat producers, suppliers, handlers, and the general public. Standard and hygienic ways of handling and processing meats are generally neglected in developing countries in the world (50,51,52,53,54,55 and 56). According to the World health Organization, foodborne diseases are estimated to have caused 600 million cases, 420,000 deaths, and approximately 33 million years of life of impairment worldwide in 2010, with Africa facing the greatest burden of mortality (57,58,59,60,61,62 and 63). In order to reduce microbial contamination, hygienic handling techniques during preparation, distribution, storage, and retail sales must be improved. For health and safety reasons, it is essential to always wear protective gear and wash hands before and after selling meat. Wearing of an apron or gown during meat handling is an important practice that aims to protect both the meat handler and the meat from exposure to foodborne pathogens (64,65,66,67,68,69 and 70). Meat safety knowledge and practices, while others determined the handling of meat practices along the beef supply chain and bacteriological quality of meat from abattoir and butcher shops in different countries in the world (71,72,73,74,75,76 and 77). The critical need in the literature to investigate the practices of food handlers in their everyday activities of employment and the potential sources of microbiological contaminants that can impair the quality of meat products (78,79,80,81,82,83 and 84). When it comes to bacterial diseases that spread through the consumption of meat and meat products, the information available about the precise amount of exposure of different populations to potential dangers (85,86,87,88,89,90 and 91). The presence of hygiene measures has an impact on hygiene, however, developed

countries in the world with excellent levels of hygiene also have foodborne diseases (92,93,94,95,96,97 and 98). Meat safety practices and hygiene were done among slaughterhouse workers, as well as on game meat production for animal class and health compliance, on the management of meat safety in abattoirs and on the traditional slaughter of goats. To protect the population from food-borne bacterial diseases, it is necessary to educate and campaign for proper sanitation and meat-handling practices in abattoirs and butcher shops (106,107,108,109,110, 111 and 112). The documentation was available with regards to meat safety practices and hygiene among butcheries and supermarkets. The objective of this study was to evaluate meat safety practices and hygiene among different butcheries and retail supermarkets. The results of this study may provide information on whether good manufacturing practices of meat are being fully followed at the retail level and whether they pose a threat to the health of the public (113,114,115,116,117 and 118).

Risks Associated with Meat Safety

Biological Hazards, Biological hazards are pathogens that can cause foodborne diseases, and they are among the most significant risks associated with meat consumption. Bacterial Infections as Salmonella, commonly found in poultry, it can lead to severe gastrointestinal diseases. Symptoms include diarrhea, fever, and abdominal cramps, often requiring medical attention. Escherichia coli (E. coli), Particularly harmful strains, such as E. coli O157., can lead to severe abdominal cramps, bloody diarrhea, and potentially life-threatening complications like hemolytic uremic syndrome (HUS). Listeria monocytogenes are Found in ready-to-eat deli meats and unpasteurized dairy products, it poses a significant risk, especially to pregnant women, newborns, the elderly, and individuals with weakened immune systems (43,44,45,46,47, 48 and 49). Viruses as Hepatitis A, can be transmitted through contaminated meat or food handlers, leading to liver disease. Norovirus, often associated with raw or undercooked seafood, it can cause gastroenteritis, characterized by vomiting and diarrhea. Parasites as Trichinella spiralis are associated with undercooked pork, it can cause trichinosis, leading to nausea, diarrhea, and muscle pain. Toxoplasma gondii are Found in undercooked lamb or pork, it can lead to flu-like symptoms, and severe cases can be serious for immunocompromised individuals. Chemical Hazards, Chemical hazards arise from harmful substances that may contaminate meat products during production, processing, or preparation. Pesticide Residues, Agricultural chemicals used in feed production can remain in meat products, potentially causing long-term health issues. Veterinary Drug Residues as Antibiotics and growth hormones administered to livestock can result in residues in meat, raising concerns about antibiotic resistance and hormonal effects on consumers. Environmental Contaminants**,** Heavy metals (such as lead, mercury, and cadmium) and other pollutants can enter the food chain through contaminated feed or water, posing health risks to consumers. Physical Hazards, Physical hazards refer to foreign objects that may inadvertently become part of the meat product, posing risks of injury or choking. Foreign Objects, these can include bone fragments, metal shards from processing equipment, plastic pieces, or even pieces of packaging materials. Processing Errors, poorly maintained equipment and inadequate inspection processes can lead to physical contaminants in meat products (99,100,101,102,103,104 and 105). Risks and Implications, the implications of these hazards can be severe Health Risks Foodborne diseases can lead to hospitalization, long-term health issues, and in extreme cases, death. Vulnerable populations (e.g., children, elderly, pregnant women) are at a higher risk. Economic Costs, Outbreaks of foodborne diseases can lead to substantial healthcare costs, lost productivity, and financial losses for businesses due to recalls and reduced consumer confidence. Regulatory Consequences, Failure to manage meat hazards can result in penalties, loss of licenses, and increased scrutiny from regulatory agencies. Mitigation Strategies, to mitigate these risks, the meat industry employs various strategies as Implementing HACCP, establishing comprehensive Hazard Analysis and Critical Control Points systems to identify and control hazards at every stage of meat production and processing. Regular Inspections and Testing, Conducting routine inspections of meat processing facilities and testing for contaminants and pathogens. Consumer Education, Providing information to consumers about safe meat handling, cooking temperatures, and storage practices (118,119,120,121,122,123, and 124).

Best practices in meat production

Implementing best practices in meat production is crucial for ensuring the safety, quality, and sustainability of meat products. These practices span various aspects of livestock management, processing, and handling. Here's a comprehensive overview of best practices in meat production, Animal Welfare by Humane Treatment, ensure that animals are treated humanely throughout their life cycle, following guidelines set by animal welfare organizations and regulations. Housing Conditions, provide adequate space, ventilation, and environmental enrichment to promote natural behaviors and reduce stress among livestock. Health Management, Regular veterinary check-ups, vaccinations, and disease monitoring are essential to maintaining the health and welfare of animals (125,126,127,128,129,130 and 131). Biosecurity Measures by Access Control, Limit access to livestock areas to prevent the introduction of pathogens. Implement measures such as visitor logs and protective clothing. Disease Surveillance, regularly monitor animals for signs of disease and maintain records to track health status. Sanitation Protocols, implement thorough cleaning and disinfection procedures for facilities and equipment to reduce the risk of disease transmission. Feed and Nutrition by Quality Feed, use high-quality, nutritionally balanced feed to support animal health and growth. Ensure feed is free from contaminants and safe for consumption. Sourcing, Source feed from reputable suppliers and maintain documentation to trace the origin of feed ingredients. Feed Additives, If using additives (such as antibiotics or hormones), comply with regulations and ensure proper withdrawal times before slaughter. Hygiene Practices as Personal Hygiene as Train workers on the importance of handwashing and personal hygiene to prevent contamination. Equipment Sanitization by Regularly clean and sanitize all equipment used in handling and processing meat to eliminate potential pathogens. Cross-Contamination Prevention as Use separate equipment and utensils for raw and cooked products to avoid cross-contamination (132,133,134,135,136,137 and 138). Slaughter and Processing by Inspection Compliance as Adhere to all regulatory inspection requirements before and after slaughter to ensure meat is safe for consumption. HACCP Implementation as Establish and maintain a Hazard Analysis and Critical Control Points (HACCP) system to identify and control hazards throughout the meat production process. Temperature Control as Maintain proper temperature controls during processing, storage, and transportation to prevent bacterial growth. Traceability and Record Keeping by Traceability Systems as Implement robust tracking systems to monitor the movement of animals and meat products through the supply chain. Documentation as Maintain accurate records of animal health, feed, veterinary treatments, processing, and distribution to ensure accountability and compliance with regulations. Sustainable Practices Through Waste Management as Implement strategies for managing waste, including composting manure and using by-products to reduce environmental impact. Resource Conservation as Optimize water and energy usage in production processes and consider renewable energy options. Integrated Pest Management (IPM) as Use sustainable pest control methods that minimize chemical use and protect the environment (139,140,141,142,143,144 and 145). Consumer Education as Transparency as Provide clear labeling on meat products regarding sourcing, processing, and safety certifications to build consumer trust. Cooking and Handling Instructions as Educate consumers on safe cooking temperatures, proper meat handling, and storage practices to minimize foodborne diseases. Training and Continuous Improvement by Worker Training, regularly train employees on best practices, food safety, and animal welfare to ensure compliance and improve overall production quality. Feedback Mechanisms as Establish systems for collecting feedback from customers and stakeholders to identify areas for improvement in practices and processes (146,147,148,149,150,151 and 152).

Prevention Measures in Meat

Salmonella, Sources are Found in poultry, beef, and sometimes in processed meats. Prevention by Cooking of meat to appropriate internal temperatures (e.g., 165°F for poultry). Avoid cross-contamination by using separate cutting boards for raw meat and other foods. Practice good hand hygiene. Escherichia coli (E. coli), particularly O157:H7, Sources are Ground beef is a common source, but it can also be found in raw milk and vegetables. Prevention by Cook ground beef to at least 160°F. Wash hands and surfaces often to prevent cross-contamination. Avoid unpasteurized dairy products. Listeria monocytogenes, Sources Can be found in deli meats, hot dogs, and refrigerated ready-to-eat foods. Prevention by Cook meat thoroughly. Refrigerate leftovers promptly and consume them within recommended time frames (153,154,155,156,157,158 and 159). Pregnant women, elderly, and immunocompromised individuals should avoid deli meats unless heated.

Campylobacter, Sources which are found in raw or undercooked poultry. Prevention through Cook poultry to at least 165°F. Avoid washing raw poultry to prevent splashing bacteria onto other surfaces. Implement strict hygiene practices in the kitchen. Clostridium perfringens, Sources Often found in large quantities of meat left at unsafe temperatures. Prevention by Keep hot foods hot (above 140°F) and cold foods cold (below 40°F). Reheat leftovers to at least 165°F. Serve food in smaller portions and keep it heated or cooled properly. Staphylococcus aureus, Sources, can be found in meats, especially those handled by people. Prevention by Ensure proper hand hygiene before handling food. Keep food at safe temperatures. Avoid leaving cooked food out at room temperature for extended periods (160,161,162,163,164,165 and 166).

Conclusion

Proper Cooking by using a food thermometer to ensure meat is cooked to the appropriate internal temperature. Cross-Contamination, use separate utensils and cutting boards for raw meat and other foods. Wash hands, utensils, and surfaces thoroughly after handling raw meat. Storage, Store meat at safe temperatures. Refrigerate or freeze meat promptly to prevent bacterial growth. Personal Hygiene: Practice good hygiene by washing hands with soap and water before and after handling food.

Conflicts of Interest

The authors declare no conflicts of interest.

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