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Evaluation of hygienic-sanitary conditions of butcher's shops in Uberlândia, Minas Gerais

Avaliação das condições higiênico-sanitárias de açougues em Uberlândia, Minas Gerais

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ABSTRACT

Introduction: In the city of Uberlândia (MG), meat retailers are classified in categories A, B and C and depending on the classification/activity category they must comply with requirements regarding structure and procedures. **Objective:** To verify the hygienic-sanitary conditions of these establishments after their regulation in the city of Uberlândia. **Method:** Inspection documents from the months of December/2015 to January/2016 from 14 butcher's shops category A that requested health permits. **Results:** Results were divided in 5 blocks: building situations and conditions; equipment and utensils; production, handling and sales personnel; storage and display of industrialized products; production and exhibition of handmade products The blocks that showed the lowest occurrence of non-conformities were those related to physical structure (22.5%), equipment and utensils (18.3%) and personnel in production, handling and sale (28.6%). **Conclusions:** It is concluded that the hygienic sanitary conditions of butcher's shops category A in the city of Uberlândia had few non-conformities regarding structures and great deficiency related to the procedures.

KEYWORDS: Hygienic and Sanitary Conditions; Butcher's Shop; Processed Meats

RESUMO

Introdução: No município de Uberlândia (MG), os comércios varejistas de carnes são classificados em categoria A, B e C e, dependendo da categoria de classificação/atividade exercida, devem cumprir exigências referentes à estrutura e aos procedimentos. **Objetivo:** Verificar as condições higiênico-sanitárias desses estabelecimentos após sua regulamentação na cidade de Uberlândia. **Método:** Foram analisados documentos das inspeções realizadas entre os meses de dezembro de 2015 e janeiro de 2016, em 14 açougues categoria A, que solicitaram alvará sanitário. **Resultados:** Os achados foram categorizados em cinco blocos, a saber: 1) situação e condições de edificação; 2) equipamentos e utensílios; 3) pessoal na área de produção, manipulação e venda; 4) armazenamento e exposição de produtos industrializados; 5) produção e exposição de produtos artesanais. Os blocos que apresentaram a menor ocorrência de não conformidades foram os relacionados à estrutura física (22,5%), equipamentos e utensílios (18,3%) e pessoal na produção, manipulação e venda (28,6%). Por outro lado, os dados apontam que os itens referentes aos blocos 4 e 5 foram os com maior ocorrência de não conformidade. **Conclusões:** Os açougues categoria A da cidade de Uberlândia apresentaram poucas não conformidades referentes a estruturas e grande deficiência relacionada aos procedimentos.

PALAVRAS-CHAVE: Condições Higiênico-sanitárias; Açougue; Carnes Transformadas

INTRODUCTION

Meat is important for human nutrition because it is rich in protein (20% to 40%), essential amino acids, in addition to containing minerals, vitamins, and carbohydrates. Meat is also one of the types of food that is most involved in food poisoning outbreaks, since it is susceptible to contamination during the stages of production, processing, storage, transportation, and marketing.[1] Temperature is one of the most important parameters to ensure its quality and shelf life.[2]

In general, meats are perishable products with variable shelf lives. Meat derivatives like cold cuts enable longer viable times and have diversified the offer of meat products. This was made possible by the development of technologies and processes—in addition to the preservatives added to the meat—that prevent bacterial deterioration and maintain the product's quality.[3]

Health Surveillance works to prevent and manage health risks, including in the area of food. This control is achieved with the inspection of businesses that sell processed and fresh food and that handle and prepare food. These businesses must comply with the regulation and standards provided for by the law and decrees within the scope of the three levels of public administration.[4]

In the city of Uberlândia, in the Brazilian state of Minas Gerais (MG), the craft manufacture of sausages and meat products in butcher shops was regulated by the Municipal Health Code[5] and detailed by Municipal Decree n. 13.013, of September 14, 2011,[6] which sets out the classification and structural conditions that each category must have.

According to the Uberlândia Municipal Decree, craft products are made from chilled fresh meat without the use of additives or substances to increase shelf life. Craft products typically have only one handler during the production process, someone who performs all the production steps.[6]

According to the Decree, only category A butcher shops can produce handled products. To be able to make these products, butcher shops must adapt their facilities (have an exclusive room for this purpose) and procedures (storage of these products). They have to send a request to the health surveillance body to be granted a permit to carry out this activity. The butcher shop will only be allowed to do this type of work after authorization from the health surveillance body.[6]

In this context, the objective of this study was to check the hygienic and sanitary conditions of butcher shops that sell processed meat (category A butcher shops) after the enactment of specific regulation in the city of Uberlândia, as well as to check their compliance with the legislation in force in the municipality.

METHOD

The study was conducted between December 2015 and January 2016. Data were collected from 14 butcher shops that requested a sanitary permit for category A butchers in 2015. The study was descriptive—with the observation and analysis of documents issued during inspections (inspection terms)—and qualitative, with the assessment of non-compliant items in the facilities and procedures adopted during food storage, production, and handling.

To categorize the findings, we used the classification proposed by Vidal-Martins et al.,[7] which consists of the assessment of the butcher shop's hygienic and sanitary conditions according to some sets of requirements. It is important to point out that we had to adapt these sets of requirements to match Uberlândia's specific legislation. Thus, the empirical data were grouped into five sets: 1 - Building situation and conditions; 2 - Equipment and utensils; 3 - Personnel in the areas of production, handling, and sales; 4 - Storage and display of processed products; 5 - Production and display of craft products.

We used Microsoft Excel 2020 to prepare the charts and tables.

RESULTS AND DISCUSSION

A total of 14 category A butcher shops that applied for a sanitary permit in 2015 were inspected. Most of the inspected shops had a business permit (78.6%), which is more than the percentage found in butcher shops in the city of Divinópolis (MG).[8]

In the documents issued during the inspections, we noticed that all butcher shops had at least one non-compliant item. These shops were notified that they had to solve the non-compliant items within 30 days. Table 1 shows the results obtained in the checklist for set 1.

Table 1. Percentage of compliance in the items of building conditions (set 1) of category A butcher shops in the city of Uberlândia (MG).

Checklist	Compliance (%)
Floor	92.9
Wall	92.9
Availability of toilets and locker rooms	92.9
Fixtures and electrical installation	85.7
Ceiling	85.7
Trash can	78.6
Sink for utensils	78.6
Disused objects	78.6
Proof of pest and urban vector control	71.4
Drain with closing system and/or siphon	64.3
Windows without pest protection	64.3
Door with closing system	64.3
Sink with paper dispenser and soap available	57.1

Source: Prepared by the authors, 2020.

Concerning the results found in set 1, about building situation and conditions, the most frequent irregularity was the absence of an exclusive sink for hand hygiene, with paper-towel dispenser and soap available (42.9%). Higher rates were found in a study with Japanese restaurants (66.7%) and sausage producers in the municipality of Rio Verde, state of Goiás (75.5%).[9]

As for the item of a washbasin for utensils, 21.4% of the shops did not have it. The absence of exclusive sinks in the production area discourages the habit of hand hygiene during production and handling. It therefore increases the risk of food contamination, especially if the employees wash their hands in the utensil sink.[9]

In 35.7% of the shops the drains did not have a closing system nor any type of blocker (wire mesh) against pests and rodents, the windows had no screens to prevent the entry of insects, and the doors had no automatic closing system. Better results were found in a study of uncured sausages made in the municipality of Rio Verde.[9]

Some of the pest-control preventive measures include fine screens in all external openings, doors with automatic closing system, drains with closing system and/or siphons, and avoiding the build-up of waste in indoor and outdoor areas. In a study with supermarkets in the city of Curitiba, state of Paraná, most of them did not do anything to prevent pests from coming in.[10]

As for the chemical control of urban pests and vectors, 28.6% of the businesses failed to present proof of service execution. Lower rates were found in a study carried out in butcher shops and supermarkets in Viçosa (MG), where 86.7% of the businesses maintained preventive and corrective measures against urban pests and vectors.

Businesses that provide food services to the population must adopt pest prevention and control measures. Chemical control should only be used when necessary, in a rational manner and respecting the appropriate grace period for each type of premises. Vectors may carry pathogens that can cause outbreaks of foodborne diseases in the population.[11]

With regard to waste collectors, they were damaged in 21.4% of the businesses. There were flies in two of them. This may have occurred because these businesses did not have preventive measures in place.[12] Better results concerning this item were achieved in a study in a municipality of the Alto Paranaíba area (MG), where all the supermarkets under study had trash cans opened by foot pedals.[13]

As for floors and walls, 7.1% of the businesses had some non-compliance with these elements. In a study of sausage production in the municipality of Rio Verde, higher non-compliance rates were found for floors (11.1%) and lower rates were found for walls (2.2%).[9] In shops that marketed meat in the municipality of Bom Jesus, state of Piauí, higher rates (80.9%) were found than in this study.[14] These items should be in perfect conditions, since the presence of cracks, flaws, leaks, drips, infiltration, mold, peeling paint, and other defects can bring contaminants to food.[15]

With regard to toilets and locker rooms, 7.1% of the businesses had toilets and locker rooms for exclusive use of food handlers. Among the butcher shops that had toilets, one had access to the handling area. The result found in this study was the opposite of that found in uncured sausage producers in the municipality of Rio Verde, where all had toilets for handlers and none of them had access to the production area.[9]

In set 2, items related to equipment, furniture, and utensils were evaluated (Table 2).

Table 2 shows that three elements were in compliance: cleaning products approved by the Ministry of Health, premises in perfect conditions, and sanitized equipment and utensils. However, concerning conservation of equipment and utensils, the following non-compliant items were observed: freezers and cold stores damaged or in poor conditions (21.4%), and oxidized hooks and hook holders (42.9%). A similar result was found in a study with supermarkets in a municipality of the Alto Paranaíba area (MG), in which only one business (20%) did not have a refrigerator in good conditions.[13]

Refrigeration and freezing equipment must be suitable for the different types of food stored there. In refrigerators,

Table 2. Percentage of non-compliance found in equipment and utensils (set 2) in category A butcher shops in the city of Uberlândia (MG).

Checklist	Non-compliance (%)
Stainless steel hooks and hook holders	42.9
Proof of recent cleaning of the water tank	42.9
Air-conditioning in the processing area	21.4
Cold stores/freezers in perfect conditions	21.4
Exclusive equipment and utensils for the processing area	21.4
Products stored in a closed and identified place (Cleaning Material Stockroom - DML)	14.2
Premises in perfectly clean conditions	0.0
Products approved by the Ministry of Health	0.0
Clean equipment and utensils	0.0

Source: Prepared by the authors, 2020.

temperature maintenance and systematic control must be recorded daily in order to avoid losses. Inadequate meat storage and cooling and lack of equipment maintenance are factors that contribute to the occurrence of foodborne diseases (FBD).[11]

Another important point in the cleaning of facilities, equipment, and utensils is water quality.[16] Of the inspected shops, only 42.9% did not present valid proof of cleaning of their water tank. All shops received supply-water from the city's Municipal Water and Sewage Department (DMAE). A study by Santos et al.[17] found values for this non-compliance below those found in this study: 33.3% of the premises were non-compliant.[17] Freitas et al.,[11] in turn, found higher levels of non-compliance, with 46.7% of the businesses not doing the proper cleaning of their water tanks.[11]

The legislation determines that these businesses have fully covered drinking water reservoirs, which must be cleaned and disinfected at least every six months.[5] Drinking water is not involved in food contamination.[11]

Regarding the storage of cleaning materials and products, 14.2% of the premises did not have a clearly identified and separate place to store cleaning materials and products. Sanitizing products in the same place as food can cause chemical contamination and the consequent loss of foodstuffs.[15]

According to the legislation that regulates category A butcher shops, processing areas must have equipment that maintains the environment at a maximum temperature of 16°C.[6] The inspections found that 78.57% of the butcher shops had processing areas with air conditioning within the ideal temperature.

The other 21.43% of the butcher shops, despite having air conditioners, did not reach the ideal temperature (16°C). Air conditioning in these areas is important because meat is a highly perishable product that, if subjected to inadequate temperatures during handling, can become an excellent means for microorganisms to breed and a risk factor for consumer health.[7]

In addition to air conditioning the area, the Municipal Decree provides that the utensils and equipment in this area must be exclusive for this activity. In this item, 78.57% of the inspected businesses were in compliance. The separation of equipment and utensils for processing activities is important to prevent cross-contamination between areas.[6] In set 3, items related to personnel in the production, handling, and sales areas were evaluated (Table 3).

During the assessment of employees in the areas of production, handling, and sales, the inspections observed that in all shops the handlers' uniforms were clean and in good conditions. However, regarding employees' behavior, the following non-compliant items were found: members of the staff wearing adornments and unprotected beards, mustaches, and hair. There was also no health certificate for the food handlers in about 50.0% of the shops.

In a study by Santos et al.[10] done in supermarkets of Curitiba, state of Paraná, higher rates of irregularities were found in handlers with personal adornments and a beard or mustache (78.9% and 36.8%, respectively).[10] A similar situation was found by a study done in supermarkets in the city of São Luís, state of Maranhão, where food handlers wore adornments, and/or did not wear caps.[18] In Itaqui, state of Rio Grande do Sul, although the handlers were wearing uniforms, these were incomplete and inadequate.[19]

A study done in butcher shops in the city of Itaqui found that 60.5% of the handlers were wearing uniforms. However, problems like incomplete and inadequate uniforms were identified. In addition, none of the shops presented health certificates for the handlers.[19]

Handlers must wear uniforms daily and change them at every change of shift, because uniforms can also become a source of contamination if worn outside the workplace.[19]

Informative posters with guidance were not available in the handling areas of 57.1% of the shops. Lower values were found in meat merchants in Bom Jesus, state of Piauí, where 17.3% of the shops did not have any guidance on personal hygiene.[14]

In five supermarkets in a city of the Alto Paranaíba area (MG), no non-compliance was found regarding food handlers.[13] As preventive measures to avoid these non-compliant items, food stores must design a Good Manufacturing Practices (GMP) plan and provide training on personal hygiene habits to their food handlers. This training should cover a number

Table 3. Percentage of category A butcher shops with non-compliance in the items referring to personnel in the area of production, handling, and sales (set 3) in the city of Uberlândia (MG).

Checklist	Non-compliance (%)
Food handlers with adornments, unprotected mustache, hair, and beard, nails not properly trimmed	57.1
Informative posters	57.1
Health certificate	50.0
Exclusive employee dealing with the change	7.1
Uniforms not changed on the premises	0.0
Dirty and unkempt uniforms	0.0

Source: Prepared by the authors, 2020.

of important measures that, when followed, can ensure adequate food quality and the prevention of contamination in processed food.[13]

Table 4 shows the percentages of personnel-related non-compliant items in the areas of production, handling, and sales.

As shown in Table 4, items like perishable products (frozen and chilled) at the appropriate temperature and expiration date were evaluated. In this regard, about 71.4% of the shops had products that were not in right the temperature recommended by the manufacturer, and 21.4% of the boneless meats were not at an adequate temperature. None of the shops were marketing expired products.

Another important aspect is the storage of these products, which are often very perishable. Inadequate meat storage and cooling and the lack of storage equipment maintenance are factors that contribute to the occurrence of FBD.

In a study done in butcher shops in the municipality of Vacaria, state of Rio Grande do Sul, 50.0% of the shops did not store the products within the temperature range specified by the manufacturers (frozen and chilled products were kept in the same freezer).[20]

A similar situation was reported by Santos et al.[10] in supermarkets in the metropolitan area of Curitiba, where they found food marketed in damaged and dirty packaging (42.8%), failure to control the temperature of refrigeration and freezing equipment (94.7%) and failure to keep the cold stores and freezers for frozen meat products at a temperature of -18°C (15.8%).[10]

Regarding the origin of the products, 7.1% of the businesses had not been inspected by the competent body. The only non-compliance found in this item was in a butcher shop that marketed products with registration only at the Municipal Inspection Service (SIM) of the city of Araguari, and was not authorized to sell them in the city of Uberlândia. Clandestine foodstuffs pose risks to consumers' health because they have no origin control and no quality assurance.[21]

Studies carried out in 30 supermarkets and butcher shops in Viçosa corroborate the study in question. In 58.8% of these shops, meat came from local meatpackers with Federal Inspection (SIF) and, in 5.9% of them, meat came from both inspected and clandestine places.[11]

The careless storage of products without proper sorting (products of animal/vegetable origin; processed/unprocessed products) in the same refrigeration equipment can create situations that are conducive to cross-contamination. Of the inspected shops, 57.1% did not have adequate storage.

Research carried out in supermarkets in the metropolitan area of Curitiba has shown risk of cross-contamination in 52.6% and 31.6% of cold stores of chilled and frozen meat products, respectively, and in 57.89% of refrigerated meat counters. It also found fish and beef/pork stored together with cheese and milk.[10]

Additionally, every food company has pay close attention to the expiration date of its products. In this study, no shop had expired products on its premises.

The inspections revealed that only 92.8% of the shops broke down the beef into steaks or ground meat in the presence of the consumer. This procedure is important for maintaining the quality of the food. In set 5, items related to the production and display of craft products were evaluated (Table 5).

All craft products made in the processing room of a butcher shop must be identified by labels approved by the municipal health surveillance body. Of the inspected category A butcher shops, only 21.4% identified craft products in their display counters. This information is important because it identifies the origin, composition, and nutrition facts of the products, ensuring their traceability.[22]

This labeling must be previously approved by the health surveillance labeling department. This approval is important because it guarantees the origin of the product by informing the ingredients, nutrition facts, calories, expiration date, packaging conditions, substances contained in the food that can cause harm to consumers' health, and more.[23] Only 42.8% of category A butcher shops had submitted their labels to the approval of the health surveillance body.

Table 4. Percentage of category A butcher shops with non-compliance in the items referring to storage and display of processed products (set 4) in the city of Uberlândia (MG).

Checklist	Non-compliance (%)
Unidentified products on the counter	92.8
Storage at the appropriate temperature and properly identified	71.4
With cross-contamination	57.1
Storage temperature (7°C) (boneless meat)	21.4
No inspection by the competent body	7.1
Beef breakdown not done in front of the customers	7.1

Source: Prepared by the authors, 2020.

Table 5. Percentage of category A butcher shops with non-compliance in the items referring to production and display of craft products (set 5) in the city of Uberlândia (MG).

Checklist	Non-compliance (%)
Labeling of craft products	57.1
Properly identified craft products	78.6
Craft products produced daily	35.7
Craft products made without banned ingredients	0.0

Source: Prepared by the authors, 2020.

In addition to mandatory identification at display, these products must be produced daily (since they expire in 24 hours) and without the use of banned products (like nitrite- and nitrate-based curing salts, non-meat protein, and mechanically separated meat).

Of the inspected shops, 64.2% only marketed craft products made on the same day, and no shop used banned products in the process. Using these additives to make these products is prohibited, since they may conceal the organoleptic characteristics of deteriorated meat, and this is considered fraud.[23]

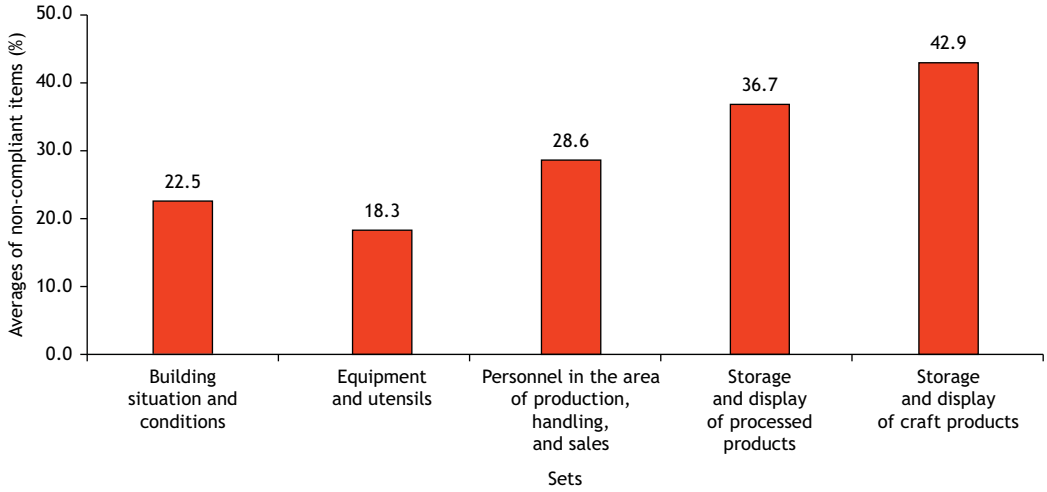
In general, the items with the highest percentage of non-compliance were sets 4 and 5, about the storage and display of processed products and the production and display of craft products (Figure). Food storage and display procedures are extremely important for the safety and quality of food.[24]

Items related to facilities, equipment, and utensils achieved the highest rates, which shows the owners' and technicians' greater concern with these aspects that are "more visible" during inspections. A study by Costa et al.,[15] in which the meat handling areas were evaluated in mini-markets in the city of Recife, state of Pernambuco, found a percentage of compliance of 83.33% in buildings and facilities, and 66.66% in the hygiene of furniture, equipment, and utensils. These results are similar to what have attained in this study. However, in their study, the furniture, equipment, and utensils of all premises were compliant, whereas our study found some situations in which the equipment was damaged.

CONCLUSIONS

From the above, we can conclude that category A butcher shops had few non-compliant items during inspections. The inspections revealed that, although the legislation that regulates this activity is fairly new, many butcher shops had irregularities that did not affect the health of consumers. Furthermore, their facilities met the needs of their business activities in terms of size and flow.

It can be said that most butcher shops have significant shortcomings in their procedures of food storage, production, and display. To get around this situation, it is important that they implement procedures for receiving food (checking the temperature, the expiration date, and recording the origin), for storage (sorting of products by category/in a tidy manner, with temperature control), for production (care with the quality of raw materials and maintenance of temperature), and for ensuring that the products are displayed with the necessary identification (item with the highest incidence of non-compliance).



Source: Prepared by the authors, 2020.

Figure. Average of non-compliant items in each set assessed using the checklist in category A butcher shops in the city of Uberlândia (MG).

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Authors' Contribution

Oliveira KA, Noronha RA - Conception, planning (study design), data acquisition, analysis and interpretation, and writing of the manuscript. Lombardi EC – Data interpretation and writing of the manuscript. All authors approved the final draft of the manuscript.

Conflict of Interest

Authors have no potential conflict of interest to declare, related to this study's political or financial peers and institutions.