Artículo Original / Original Article

Food handling conditions of university canteens

Condiciones de manipulación alimentaria de los comedores universitarios

ABSTRACT

The aim of this study was to evaluate the hygiene and sanitary conditions of canteens in a Brazilian public university. A checklist was applied and coliform analysis at 45 °C. Aerobic mesophilic bacteria on surface boards used in food handling were also counted. It was observed that most of the canteens were considered unsatisfactory in terms of compliance with good handling practices. Presence of coliforms at 45 °C was noted in 72% of the food handling surface boards. With respect to mesophilic bacteria, 81% of the boards presented values above the recommended. According to the results, it is possible to say that based on hygienic-sanitary guidelines, the canteens were not in accordance with Brazilian law that regulates good manufacture practices of the food service industry and recommends that facilities, equipment and utensils used in food handling are in proper hygienic-sanitary conditions. The food production process for the university population was not properly carried out due to non-compliance with good handling practices. Thus, the health of thousands of students and staff who have their meals daily at the university canteens may be at risk.

Keywords: Foodborne Diseases, Good Handling Practices; Microbiological Quality.

RESUMEN

El objetivo de este estudio fue evaluar las condiciones higiénico-sanitarias de las cafeterías en una universidad pública brasileña. Se aplicó una lista de verificación y también se llevaron a cabo análisis de coliformes y recuentos de bacterias mesófilas aeróbicas en tablas de cortar utilizadas en la manipulación de alimentos. Se observó que la mayoría de las cafeterías se consideraban inadecuadas en cuanto al cumplimiento de las buenas prácticas de manufactura. La presencia de coliformes se observó en el 72% de las tablas de manipulación de alimentos analizadas. Con respecto a las bacterias mesófilas, 81% de las tablas presentaron valores superiores a los recomendados. De acuerdo con los resultados, es posible decir con base en la evaluación de las condiciones higiénico-sanitarias, que las cafeterías no estaban de acuerdo con la legislación brasileña que

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regula las buenas prácticas de manufactura en servicios de alimentos y recomienda que las instalaciones, equipos y utensilios utilizados en la manipulación estén en condiciones higiénico-sanitarias adecuadas. El proceso de producción de alimentos destinados a la población universitaria no se lleva a cabo adecuadamente debido al incumplimiento de las buenas prácticas, ya que pone en riesgo la salud de miles de estudiantes y personal que comen diariamente en los comedores universitarios.

Palabras clave: Buenas Prácticas de Manufactura; Calidad Microbiológica; Enfermedades transmitidas por alimentos.

INTRODUCTION

Out-of-home meals have been increasing among the

population over the years due the difficulties imposed by distances and extended working hours, making food services an alternative to mealtime¹.

Food services are structures that belong to the collective feeding sector, whose purpose is to manage the development of nutritionally balanced and safe meals, with respect to sanitary standards for food consumption outside the home. Therefore, they are environments that contribute to maintaining or recovering the health of communities, and also, help in the development of appropriate eating habits². Their main activities are directly related to food, such as handling, storage, preparation and exposure for sale³. However, food services are also concerned with aspects related to customer satisfaction with regard to flavor, variety of menu, and eating environment⁴.

In universities, ready-to-eat meals and snacks are offered in canteens and are not usually controlled with respect to sanitary quality of the food production. Canteens most often do not have the appropriate physical structures or even the presence of a trained technician⁵.

All food services, including school establishments, must comply with a series of determinations related to processes and services, ranging from their facilities, purchasing, storage and food handling. They also include documentation and record-keeping to provide, among other items, nutritionally adequate meals and minimize the risk of occurrence of foodborne diseases⁶.

Commercial or institutional establishments producing meals are conducive to microbial contamination. Some studies have revealed the presence of pathogenic microorganisms in hospital and school feeding services, university restaurants, and other places, highlighting the presence of coliforms at 35 °C and 45 °C, coagulase-positive *Staphylococcus*, molds and yeasts⁷ and *Escherichia coli*⁸.

Among the contamination points, food-handling surfaces can contribute considerably to proliferation, since there may be contact with microorganisms directly or through dust, removed by drafts or brought by animate or inanimate vehicles. Thus, a constant evaluation of the microbiological conditions of the environments related to the pre-preparation and preparation of food is essential to avoid contamination⁹. According to Coelho et al.¹⁰, some contamination points such as ambient air and handling surfaces are potential sources of microorganisms that can allow cross-contamination if strict preventive measures are not adopted.

In Brazil, the current technical regulation, Resolution of the Collegiate of Directors - RDC No. 216/2004 of the National Health Surveillance Agency (ANVISA), which establishes requirements for good practices in food services, aims to ensure sanitary conditions in all stages involved in food preparation³. Thus, considering the importance of safe food production and the necessity of offering meals with no risks to the consumers, the current study aimed to analyze the sanitary conditions of canteens of a public university in Brazil and identify inadequacies that can have negative

consequences for the public health, since universities offer food to a considerable number of people.

MATERIAL AND METHODS

This cross-sectional study was carried out in eleven canteens located in the central campus of a public university in the state of Rio Grande do Norte, Brazil, between 2015 and 2016. A total of 5 visits were made in each canteen participating in the study. The first visit was to identify the canteen and present the consent form to the owners of the establishments, in order to inform them about the conditions of the study. Three visits were then carried out in each canteen, on different days, to apply a checklist to assess sanitary conditions. The interval between visits to each canteen was approximately 1 month. On the fifth visit, samples of food handling surfaces (cutting boards) were collected for microbiological analysis.

The study was approved by Ethics Committee of the Federal University of Rio Grande do Norte (protocol number 30951514.8.0000.5292).

Assessment of hygienic-sanitary conditions

A checklist¹¹ was used to evaluate hygienic-sanitary conditions sanitary conditions of canteens based on the Ministry of Health Resolution RDC No. 216/2004 of the ANVISA³, which is the Brazilian law that regulates good manufacture practices of food services. The checklist contained 183 items grouped into 12 blocks of evaluative aspects related to: 1) buildings, facilities, equipment, furniture and appliances; 2) cleaning of facilities, equipment, furniture and appliances; 3) urban pest control; 4) water supply; 5) waste management; 6) handlers; 7) raw materials, ingredients and packaging; 8) food preparation ; 9) storage and transportation of prepared food; 10) exposure to consumption of prepared food; 11) documentation and registration and 12) technical responsibility.

The data were collected observing the actual conditions of each canteen by two trained assessors with sufficient knowledge of the checklist, which allowed a better analysis of the items in relation to the reality of the place. The requirements that could not be evaluated through visual assessment were answered through questioning the person responsible for the canteen and/or submission of supporting documentation during the time of data collection. The items were evaluated and classified as "adequate", when they meet compliance RDC No. 216/2004, "inadequate", when they are not in compliance with the standards, and "not applicable", when the items were not applicable to the reality of the canteen. "Non-applicable" items were subtracted from the calculation of the adequacy percentage.

Adequacy percentage for each block analyzed was obtained and food services were classified as: "Very unsatisfactory" when meeting from 0% to 19%; "unsatisfactory": from 20% to 49%; "Regular": from 50%

to 69%; "Good": from 70% to 90% and "Very good": from 91% to 100%¹¹. Thus, > 70% was established as the cutoff to assess canteens adequacy regarding the hygienic-sanitary conditions. To attain the final diagnosis for each canteen, the mean of the adequacy percentages taken from the three visits made was calculated.

Microbiological Analysis

In order to carry out microbiological analysis of food handling environment, samples were collected from the surface cutting board. Cutting boards are the most commonly used food handling surface in the canteens and offer a high risk of causing toxoinfection⁹. The collection was performed with boards ready for use, that is, sanitized by the person responsible for the handling, in order to evaluate the effectiveness of the cleaning and disinfection procedures performed.

Sampling was performed using the swab technique as defined in the ISO 688712. The surface collection procedure with sterile swabs was performed twice on each surface using a 25 cm² sterile template and a 50 cm² sample was taken. Then, the swab was transferred to the diluent (0.1% w/v peptone water) and transported immediately after the collection to the Food Microbiology Laboratory of the Department of Nutrition of Federal University of Rio Grande do Norte in a cool box with ice packs.

To determine the Most Probable Number (MPN) of coliforms at 45 °C, the multiple tube method was used¹². The standard count on bacteria plates of the aerobic mesophilic group was carried out according to ISO 688712 and in duplicate.

Analysis of Results

The reference standards used to assess the hygiene conditions in the surface boards in relation to the aerobic

mesophilic and coliform bacteria at 45 °C were based on Silva Júnior⁹, which classifies aerobic mesophilic > 50 CFU/cm² of and presence of coliforms in 50 cm² of the sample as unsatisfactory.

RESULTS

Good Handling Practices

The results of the assessment of good handling practices through the application of the checklist show that none of the canteens was considered adequate. 18% of the canteens were classified as "regular" and 82% were considered as "unsatisfactory" with regards to sanitary conditions.

The block "facilities, equipment, furniture and appliances", presented considerable variation in adequacy percentage between canteens. The final mean value presented a 54.93% adequacy for this item (Table 1). During the visits, it was found that the facilities were not designed to promote the cleaning operations nor to allow an orderly flow in the preparation stages of foods and there were no means of separation for the different food-handling activities. In addition, the doors and windows had no millimeter screens and they were also misaligned with the edges.

The walls, floor and ceiling were inadequate with cracks and irregularities, unprotected luminaries, no hand-washing dedicated basins in the handling areas, appliances showing rust and roughness, non-washable furniture and exposed and unprotected electrical installations, all of which hampered cleaning. A positive aspect, common to all canteens, was the fact that appliances used for customers' meals (disposables or not) were stored in sheltered and clean places; however, wood appliances still have been found, which are inadequate for posing a risk of contamination and are difficult to clean.

The item "hygiene of facilities, equipment, furniture and appliances" was the one that presented the best percentages in relation to sanitary condition, having an average adequacy of 65.24%. Routine hygiene procedures, exclusive and

Table 1. Adequacy of hygienic-sanitary conditions of canteens in a Brazilian public university.

Blocks	% ± SD
Buildings, facilities, equipment, furniture and appliances	54.9 ± 13.2
Cleaning of facilities, equipment, furniture and appliances	65.2 ± 14.4
Integrated urban pest control	32.3 ± 26.5
Water supply	30.7 ± 6.7
Waste management	41.7 ± 25.6
Handlers	35.7 ± 20.5
Raw materials, ingredient and packaging	56.6 ± 17.1
Food preparation	42.9 ± 15.7
Storage and transportation of prepared food	NA
Exposure to consumption	55.9 ± 11.6
Documentation and registration	0.00 ± 0.00
Liability	18.2 ± 25.9

% – Percentage of adequacy; SD – Standard Deviation; NA – Not applicable.

trained cleaning staff, use of regularized sanitizing products, appliances and equipment used in sanitation stored in reserved, clean area and in enough quantity according to the demand of the premises were the aspects that most contributed to the adequate conditions in this regard.

“Urban pest control” was an item with large discrepancy among the mean percentages. Canteen 6 showed total compliance with this item, while other canteens showed a reduced percentage. The main inadequacies found were: presence of insects (flies, ants) in the indoor areas, and, in some sectors of the university, populations of cats near the canteens. Many of the establishments carried out the chemical control of pests, such as ants, flies and cockroaches, without a contract with a specialized company, thus executing the decontamination service autonomously, without the specialized technical responsibility required by the legislation and with the use of poisons commonly purchased on the open market.

With regards to the “water supply”, the mean adequacy rate found was 30.68%, considering all food services analyzed. It was not possible to evidence actual conditions of the water reservoirs and, as result, this block presented a low level of adequacy due to the lack of mandatory documentation by those responsible for the canteens. Although this block had a low percentage of adequacy, an important element noted was the use of drinking water in food handling and, in places where ice was used, it was purchased from regularized manufacturers and thus produced from drinking water.

Regarding the assessment of the “handlers”, most canteens did not present a satisfactory mean of adequacy and the final classification percentage for this block was 35.66%. The main causes for this low percentage of adequacy according to the legislation were the presence of ornaments such as earrings, rings and bracelets; use of open shoes, lack of hair protection, and contamination acts, such as cell phone use and unnecessary talk during food handling.

The item “raw materials, ingredients and packaging” was the second block with the highest percentage in compliance, with a mean of adequacy of 56.64%. In spite of appearing as the second best item in accordance with the legislation, some specific criteria were not being observed, such as: lack of care regarding supplier selection, product inspection without temperature checking, inappropriate identification and storage of raw materials, among others.

The item “Food preparation” showed low adequacy in compliance with what is recommended by the legislation. An important issue noted was the number of employees, equipment and appliances compliant with food production. However, there were some problems such as lack of temperature monitoring during storage or heat treatment, incorrect thawing, lack of physical separation and/or measures to prevent contact of raw, ready and semi-ready foods. Few canteens worked with fried foods, so there was no use of oils and fats. “Storage and transport of prepared food” was an item that did not apply to the reality of university

canteens, since they did not have any food production for transportation to another place of consumption.

In relation to “exposure to consumption of prepared food”, the results presented 55.93% adequacy. Among the negative issues that were found, it is possible to cite the lack of adequate monitoring of exposure equipment temperature. Food services that do not perform temperature control of served meals have no guarantee that the food is safe for consumption.

With regard to “documentation and registration”, 100% inadequacy was noted in all establishments, since none of the four Standard Operating Procedures (SOP) were duly registered and implemented in the establishments and the Good Practices Manual was unknown. In the item “liability”, only 18.18% adequacy was noted. In the canteens, the person responsible for the food handling activities was the owner or designated employees. Those responsible stated that they had some previous knowledge or participated in courses, but did not present any kind of supporting documentation, except for a few, which presented documents proving training or courses which, however, had not been taken recently.

Microbiological analyzes

The presence of coliforms at 45 °C was detected in 72% of cutting boards and only 28% were safe (Figure 1). The results demonstrate the possible commercialization of food in inadequate sanitary conditions in university canteens, which could bring harm to consumer’s health.

Figure 1. Sanitary conditions in canteens in a Brazilian public university according to microbiological analysis of cutting boards.

Based on the reference proposal of Silva Júnior⁹ used in this study, canteen 3 figured as the one in which a considerable degree of coliform contamination was detected, with a concentration >1100 Most Probable Number of coliforms. Canteens with satisfactory classification include: canteens 1, 8 and 10 with values <3.0 Most Probable Number of coliforms at 45°C (Table 2).

Table 2. Microbiological evaluation of food cutting boards in canteens of a Brazilian public university.

MICROBIOLOGICAL ASSESSMENT				
Coliforms at Canteens	Classification 45°C (MPN ¹ /50cm ²)	Aerobic	Classification Mesophilic (CFU ² /cm ²)	
1	<3,0	Satisfactory	1 540	Unsatisfactory
2	3,6	Unsatisfactory	30	Satisfactory
3	>1 100	Unsatisfactory	3 360	Unsatisfactory
4	3,6	Unsatisfactory	264	Unsatisfactory
5	38	Unsatisfactory	23 680	Unsatisfactory
6	460	Unsatisfactory	216	Unsatisfactory
7	23	Unsatisfactory	1 920	Unsatisfactory
8	<3,0	Satisfactory	18	Satisfactory
9	3,6	Unsatisfactory	1 820	Unsatisfactory
10	<3,0	Satisfactory	740	Unsatisfactory
11	1 100	Unsatisfactory	4 600	Unsatisfactory

¹MPN – Most Probable Number of coliforms at 45°C; ²CFU – Colony Forming Units.

It was also noted that 81% of the investigated canteens were classified as unsatisfactory according to Silva Júnior⁹, once the presence of aerobic mesophilic bacteria was detected in the cutting boards analyzed, in which sanitary conditions were found to be inadequate. The canteens that contributed to this unsatisfactory percentage for aerobic mesophilic bacteria were canteens 3, 5 and 11. The counts of these microorganisms ranged to 3.4×10^3 CFU/cm² and 2.4×10^4 CFU/cm² (Table 2). The places classified with satisfactory conditions were those that obtained results lower than or equal to 50 CFU/cm², within this range canteens 2 and 8 were the only ones that fit the proposed reference standard with 3.0 and 1.8×10^1 CFU/cm², respectively.

DISCUSSION

Results of checklist regarding good practices and cutting boards microbiological analysis, showed nonconformities in some areas of the canteens visited, suggesting a risk of contamination in the production of foods offered to the university community. These are extremely worrisome findings, since an environment intended for handling and commercialization of foods with sanitary and hygienic inadequacies status can cause serious damages to the consumer's health⁹.

The results found in this research in relation to good practices corroborate the study conducted by Torres et al.¹³, in which school restaurants were assessed, and problems were found regarding the minimum requirements for adequate sanitary conditions, such as sanitation, handling of raw materials, storage and infrastructure.

In a study involving 29 canteens in municipal public schools in Brazil, only 4.4% were in a low risk situation, while the others showed a high index of inadequacies regarding

good practices. Among the school canteens, 48.3% were classified in “regular” health risk, 24.3% were in “high” health risk and 24.0% were in “very high”¹⁴. Other study carried out in 182 canteens in public and private schools in the Federal District found that most establishments were classified as “deficient”, while a small portion was considered “good” or “very good” regarding the hygienic-sanitary conditions based on Brazilian law¹⁵.

Siqueira and Costa¹⁶ evaluated 8 public university canteens for good practices, reaching between 0% and 50% of adequacy. After a training in good practices, the analysis of the results showed that the canteens had an improvement in the results, reaching up to 75% adequacy, which demonstrates the importance of training of people involved with food handling.

The item “hygiene of facilities, equipment, furniture and appliances” obtained the highest adequacy percentage. The results of the checklist showed that the frequency in the hygiene of the internal areas was properly performed, consistent with the need for the routine of the service and carried out by trained employees who were not directly involved in the handling of food while cleaning the outdoor facilities, as guided by ANVISA³. Despite the excellent results related to the frequency of hygiene, the high standard deviation in some canteens translates to a discrepancy in the performance of this operation considering the three visits made.

The study conducted by Arbos et al. showed that “cleaning of facilities, equipment and appliances” presented the lowest indices of inadequacy (37.0%) when compared to the other blocks, supporting the findings of the present research. Although we identified the highest level of adequacy

in this block, the absence of some important practices in canteens was observed: lack of dilution criteria for the products used in the hygiene process and insufficient time for action of the products used, which may have contributed to the observed microbial growth in equipment and appliances.

The block "raw materials, ingredients and packaging" obtained the second highest percentage of adequacy among the canteens studied. Even though it brings one of the best suitability values, some requirements have proved to be far from those recommended by current legislation, such as the absence of specific and relevant criteria for supplier selection; inefficient food inspection (often being poorly executed and with no temperature checking); raw foods left close to ready-to-eat food, bringing a possible risk of contamination⁹.

Raw materials must have specific identification and be stored in appropriate places³. Many canteens stored raw materials on shelves or pallets, but they did not respect the proper spacing in regards to the wall and floor, thus facilitating access to foods by urban pests. It was evidenced that the shelves were of non-washable material, which also makes it difficult to sanitize furniture. Similar conditions were found by Arbos et al.¹⁷ in which food storage in the canteens investigated also did not meet the criteria of the law and refrigerated and/or frozen foods were stored incorrectly and were still had no labels that reported the validity of products previously opened and stored in those canteens.

In **Table 1**, we can see that the item "documentation and registration" showed 0% adequacy, evidencing that the mandatory documentation for food services operation was not in accordance to current legislation. Food services, including canteens, should have a Handbook of Good Practices and Standard Operating Procedures (SOP), and these documents need to be available to service staff and health authorities when requested³.

None of the four SOPs required by RDC No. 216/2004 (hygiene of facilities, equipment and furniture; integrated vector and urban pest control; water storage tank hygiene and hygiene/health of handlers) were registered and implemented in establishments and many of the owners of canteens were not aware of the Good Practices Manual, an essential record for the food service³.

It is important to underscore that this is not an isolated case, that the same thing happens in other Brazilian universities. In a similar study carried out at the Federal University of Ceará, canteens did not have a Manual of Good Practices or Standard Operating Procedures. There was also a lack of knowledge related to the laws that regulate food service operations regarding Good Practices, which contributed to the irregular situation found in these canteens¹⁶. In another study involving school feeding units, a low percentage of compliance was also observed due to non-implementation of the Good Practices and Standard Operating Procedures Manual¹⁸.

In addition, current Brazilian regulations require that food handling be supervised by a Technical Officer, who

may be the owner or an employee, as long as they prove training in the issues of "food contaminants", "foodborne diseases", "hygienic food handling" and "good practices"³. In the canteens researched, responsibility for food handling activities was incorporated by the owner or designated employees, but most did not produce any supporting documentation as required by national legislation.

With respect to the microbiological quality, the analysis of coliforms at 45 °C is extremely important because they are microorganisms that indicate health risks and point to sanitary conditions¹⁹. The positive results for coliforms at 45 °C observed in 72% of the establishments may be due to the inadequate practices during or after the sanitation processes, such as: use of dish cloths with food remnants and/or dirt from the drying of appliances after washing; improper storage location; deficiency in the hygiene process and others.

According to Silva Júnior⁹, the surfaces used for the preparation of food should be perfectly sanitized; taking care not to forget that waste, food crumbs or stains on appliances and other places of contact with food can be a hotbed of microorganism; in addition, cloths that come in contact with appliances need to be changed every day and boiled before returning to use.

In this study it was evidenced that canteen 3 had the highest level of contamination. This result may be due to two factors observed at the moment of collection, such as: deficiency in the hygiene process and drying of the appliance with a cleaning cloth after washing⁹. Both factors may favor cross-contamination. Not only the inadequacy of cleaning procedures but also the use of cloths that have contact with different types of surfaces, equipment and appliances inside food production sites may be conduits of microorganisms²⁰.

Vila et al.²¹ assessed the sanitary conditions of kitchens in public schools, and detected irregularities regarding the use of cleaning cloths. None of the schools analyzed carried out a cleaning process of these towels in the daily routine, only replacing them at the end of the day. This irregularity, according to the same authors, violates the state legislation, which recommends that the cleaning cloths must be changed every 2 hours, not exceeding 3 hours, and can only be used again after adequate cleaning²².

Costa et al.²³, assessed the sanitary quality of cheeses and found high *E. coli* contamination. According to the authors, the presence of this microorganism may be associated with inadequate heat treatment or subsequent contamination, since some hygiene and personnel requirements established in the sanitary regulations were inadequate, which were caused by incorrect storage, conservation and handling of cheeses.

A study conducted by Cerqueira et al.⁷, which also assessed coliforms counts at 45 °C on food handling surfaces, showed unsatisfactory results similar to the data observed in the present study, since the presence of bacteria of this group was detected in the samples investigated. Another

study carried out by Arbos et al.¹⁷ demonstrated the presence of coliforms at 45 °C in equipment and appliances used in food preparation in university canteens. The presence of these microorganisms indicates fecal contamination¹⁹, evidencing flaws in hygiene processes and consequently compromising the quality of the food served⁹.

To reduce cross-contamination, the use of non-recycled paper towels in the food production environment should be adopted if it is not possible to ensure the correct hygiene of dish cloths. Furthermore, it is necessary to remain cautious regarding the storage place of the appliances and equipments while they are not being used, that is, they must be kept in appropriate hygienic-sanitary conditions³.

The counting of aerobic mesophilic bacteria on cutting boards is a way to monitor the hygienic quality of surfaces that are in direct contact with food, indicating an alert to hygiene guidelines^{24,25}. The results concerning the presence of these bacteria in the cutting boards of the investigated university canteens demonstrate a high count of these microorganisms, with 81% of the canteens classified as unsatisfactory⁹. Arbos et al.¹⁷, assessed canteen appliances and equipment and also revealed high levels of contamination with food services evaluated classified as “very unsatisfactory” for aerobic mesophilic bacteria.

Among all investigated sites, canteen 5 had the highest level of contamination by mesophilic microorganisms, showing a value of 23,680 CFU/cm² (2.4 x 10⁴). This result may be due to the unsatisfactory storage conditions observed during data collection and the deficiency in the hygiene process of the cutting boards. Battaglini et al.²⁶ also analyzed cutting boards and evidenced high counts of mesophilic microorganisms, *Escherichia coli*, molds and yeasts, which are considered important sources of contamination during food processing.

The presence of microorganisms in food cutting boards has been confirmed in other research. Losito et al.²⁷ who investigated the hygiene conditions of food contact surfaces in retail markets and detected that Teflon cutting boards were among the most contaminated appliances in relation to the total aerobic count (> 500 CFU/cm²), specifically in the following food categories: fish products and deli meats. Microbiological safety is linked to compliance in strict hygiene practices during the manufacturing process or subsequent use²⁸.

According to Costa et al.²³, the quality of food becomes irrelevant if adequate conditions of preparation and storage are not respected. Therefore, it is important to perform adequate cleaning procedures on equipment and appliances before processing, transporting, preparing, preserving and serving food⁹. Hygiene and sanitation are paramount procedures in sanitary control, however, they are frequently neglected or performed in inadequate conditions in food preparation environments²⁹. Such procedures, when properly carried out, can contribute to guarantee hygienic-sanitary quality of foods offered to the university population.

Finally, is important to emphasize that in Brazilian public

institutions, the concession of physical space for commercial exploitation occurs through public procurements. Service companies can be selected considering the lowest price of the products offered and not the guarantee of their quality. In the case of canteens, the lack of financial resources to maintain the physical area and equipment in adequate conditions and to hire a technician to take responsibility for the quality of commercialized food is common. Since the provision of healthy food in its different dimensions is a factor that implicates life satisfaction of university students³⁰ the relevance of food safety in the academic environment should not be ignored by managers of public institutions.

CONCLUSION

The results showed that none of the university canteens presented adequate sanitary conditions, reflecting improper food production processes for the university population. Microbiological analysis demonstrated poor hygienic-sanitary quality of the cutting boards used in canteens, showing the needing to take urgent and effective measures to reduce or eliminate microbiological contamination of such appliances.

To conclude, ensuring good quality food for the university campus requires the joint action by the owners of the canteens, who are in charge of providing the service, the university, which must monitor and provide the best possible conditions so that the owners can carry out their work in compliance with the law, and the students themselves, who must demand and fight for food that is certified with respect to food safety.

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