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Hygienic-sanitary characterization and proposal for the elaboration of essential operational requirements for street foods sold in Brazilian food trucks

Juliana Ribeiro DIAS[1], Gustavo Luis de Paiva Anciens RAMOS[1,2*], Iracema Maria de Carvalho da HORA[1], Denise Rosane Perdomo AZEREDO[1]

Abstract

The Food Truck segment has become a food option with quality and reduced cost. The objective of the present work was to analyze the hygienic-sanitary quality of street foods sold in food trucks and to propose essential operational requirements for the control of hazards associated with this food sector. The cross-sectional descriptive study model was used with the application of a questionnaire to verify the hygienic-sanitary conditions of the food handlers of the trucks in the state of Rio de Janeiro, Brazil, and a checklist to evaluate the structural conditions and compliance with the standards provided for in legislation. Among the handlers, 60% did not wash their hands properly, 62.9% did not have a training course and 18% of the trucks did not have a sink with potable water. Non-conformities were also observed at the points of sale, mainly due to the absence of an exhaust system and protection gutter for lamps. Thus, a proposal of essential operational requirements for food trucks was elaborated. There is a clear need to recognize this segment as an integral part of the commercialization of street food, proposing a specific control, increasing inspection, and use of a training program.

Keywords: food truck; operational requirements; street food; food quality management.

Practical Application: The regulation of the segment is urgent, due to its growth and relevance at the national level. A proposal of essential operational requirements for food trucks in Brazil was elaborated.

1 Introduction

The proportion of food consumed outside the home has increased in Brazil. Following this trend, the segment known as food trucks gained more followers around the world and became a relatively more accessible and good quality food option, both in terms of investment potential and consumption potential (Lichy et al., 2022; Rodrigues et al., 2021).

Also known as food mobiles, they consist of small trucks, vans, or trailers that house industrial kitchen equipment and sell various meals on public roads and areas, attracting the interest of investors not only from large restaurants and fast-food chains but also from small business owners. They can be installed on city streets and avenues or in private spaces, such as parking lots, food parks (commercial spaces for renting spaces), and events (Serviço Brasileiro de Apoio às Micro e Pequenas Empresas, 2015).

Currently, food trucks are found in the most diverse regions of Brazil offering the most varied menus, serving traditional gourmet sandwiches, pizzas, pasta, sweets, regional foods, Japanese food, tacos, palettes, and natural juices, aiming to meet the preference of the various public and provide them with a gastronomic experience. Despite the ease of installation of this type of business, its growth and socio-economic, cultural, nutritional, and hygienic-sanitary importance, there is still a lack of a national law to standardize both the food truck concept and the procedures and documents necessary for the authorization of this activity, with only a few laws at the municipal level (Bispo & Almeida, 2020; Lichy et al., 2022).

The present study intends, therefore, to provide subsidies for the standardization of procedures that enable the management of risks associated with the food truck segment, as well as to propose essential operational requirements for the safety of food handled and distributed through this segment.

2 Material and methods

A descriptive and cross-sectional study was applied, following the model adopted in other studies (Cortese, 2013; Souza et al., 2015). A sample of 35 food truck establishments, located at different points in the state of Rio de Janeiro, was selected for the application of the questionnaires and checklist previously prepared. The choice of establishments was performed at random, considering those who agreed to participate in this study with free consent.

The questionnaire applied to the handlers had six variables with 17 indicators, including the definition of the socioeconomic profile, the characterization of the point of sale, and the evaluation of the attendant/handler.

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[1] *Instituto Federal de Educação, Ciência e Tecnologia do Rio de Janeiro, Rio de Janeiro, RJ, Brasil*
[2] *Faculdade de Farmácia, Universidade Federal Fluminense, Niterói, RJ, Brasil*
*Corresponding author: gustavoanciens@id.uff.br

The interview consisted of open and closed questions, being directed to the managers of the establishments, considering four variables with 14 indicators, addressing the identification of the manager and the establishment, characterization of food, evaluation of the storage and transport conditions of the raw material and conditions of water supply and sewage.

Data were obtained through targeted questions and immediate inspection. In data processing, the number coding system was used, aiming to guarantee confidentiality regarding the evaluated establishment and the professional who participated in the research.

Microsoft Office Excel was used to enter the collected data with a subsequent description of the variables using descriptive statistics, which consists of the calculation, presentation, analysis, and interpretation of the observed data in absolute values and percentages (Cortese, 2013). To analyze the open questions, the multi-referential approach was used, as a way of understanding this phenomenon from different angles (Martins, 2004).

3 Results and discussion

Operational controls are important to ensure food production in hygienic-sanitary conditions suitable for consumption (Associação Brasileira de Normas Técnicas, 2015). Considering that food trucks not only transport food but also tend to handle it at the point of sale, it is up to owners and managers to implement and maintain such operational controls, in order to reduce the risks of foodborne diseases and recontamination of the food (Rane, 2011).

There is a preference for cart-type food trucks (74.3%) which can be explained by the greater availability of space they offer and not the need for the driver to be licensed for a truck (Serviço Brasileiro de Apoio às Micro e Pequenas Empresas, 2015). The Kombi and Van types corresponded to 11.4% each.

3.1 Sociodemographic profile

There was a predominance of males (58.6%) among the interviewees, most of whom were managers and handlers. As for the level of education, 71.4% of the managers had started or completed higher education, while only 34.3% of the handlers had the same level of education (Figure 1). Although Samapundo et al. (2015) state that the level of education has no significant effect on the safety of marketed food, it is believed that this segment operates with individuals capable of assimilating the basic concepts of hygiene and food handling, since only 5.7% of the handlers included in this study did not have completed elementary school.

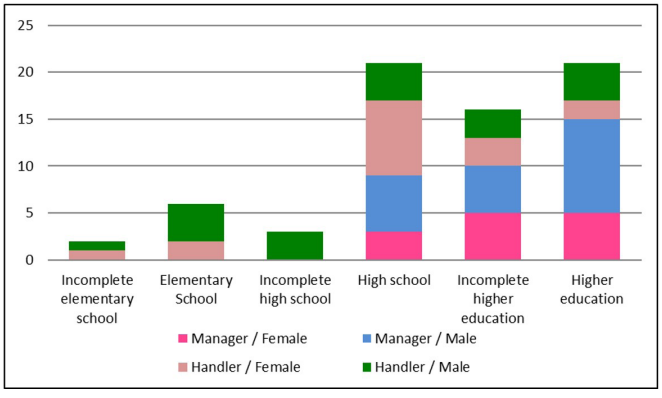

Figure 1. Education level of managers and food handlers who work in the food trucks addressed.

Considering the criteria of the Brazilian Institute of Geography and Statistics for the division of social classes, most individuals who work in this area (74.3%) have a family income of fewer than 4 times the minimum wage. Also, it was observed that the median monthly billing of food trucks was R$ 20,838.00, with a range of R$ 5,000.00 and R$ 120,000.00, with 40% of the analyzed locations earning up to R$ 14,999.00/month.

3.2 Types of food sold

The products found for sale were potatoes (fries, rosti and stuffed), Japanese food, Portuguese food, shredded pork and beef ribs, crepe, sweets (cakes, brownies, cookies, and Italian straw), snacks (hamburger, artisanal hamburger, hot dog, bread with sausage, sandwiches), pizza, meal (ready-to-eat dishes, risottos, and pasta), snacks and portions, steaks and drinks. Figure 2 illustrates the number of vendors and the types of food and beverages sold. There is a preference for the sale of snacks (66%), including artisanal hamburgers, bread with sausage, hot dogs, and other types of sandwiches.

About 38.2% of the establishments reported selling more than one type of food, despite the reduced handling location. This practice facilitates cross-contamination if the necessary care is not taken during food handling and preparation. 77.1% of establishments also sold beverages.

Most of the products were partially produced at the point of sale, as informed in the interviews. Only 8.6% fully produced the product at the point of sale.

3.3 Criteria for the acquisition of raw material and sorting from the supplier

77% of food truck managers stated that they purchase storable and perishable inputs from distributors and wholesalers, mainly considering the quality (60%), price (42.8%), and expiration date (31.4%) when purchasing the material raw, ingredient or food. The interviewees also mentioned decisive criteria when choosing: hygiene and the condition of the merchandise (17.1%), product brand (17.1%), consistency of supply (11.4%), and the supplier's history (11.4%).

When asked about the criteria considered for choosing the suppliers that will serve their food trucks (Figure 3), the prevalence of price is observed as a determinant for 57.1% of managers, followed by the indication (37.1%) of friends, family, and other establishments.

Despite its importance, the technical visit was considered by only 20% of managers as a decisive criterion in choosing the supplier of inputs. When asked about carrying out a previous visit to the supplier establishment, 37.1% stated that they had

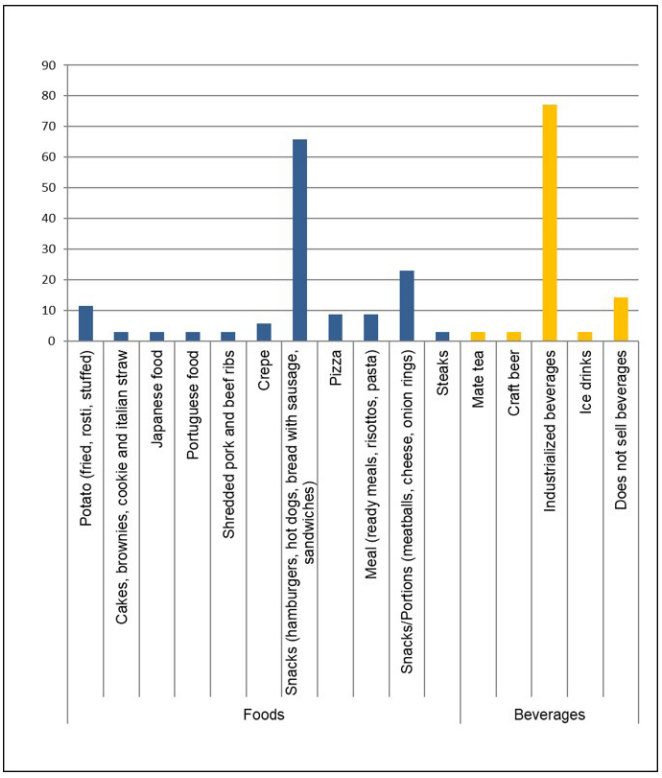

Figure 2. Types of food and beverages sold in the food trucks addressed.

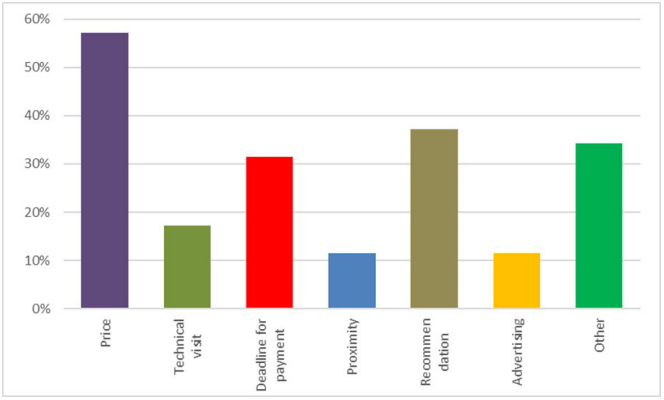

Figure 3. Criteria considered by the managers of the food trucks approached for choosing the supplier of inputs.

previously visited the supplier. In general, the owners and partners are responsible for carrying it out.

3.4 Conditions of transport, handling and storage

Figure 4 illustrates the means of transporting raw materials/food to the food trucks parking point.

It was observed that 67.6% of the locations transported the goods at a controlled temperature using a thermal container (cooler, bags, styrofoam) and 35.3% in a supplier's refrigerated truck, representing a better scenario than that identified by

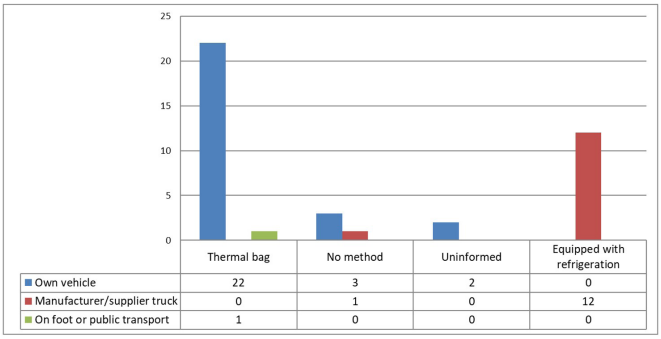

Figure 4. Means of transporting raw materials and food to the food trucks.

Cortese et al. (2016), when evaluating street vendors and identifying only 19% transporting food under refrigeration.

Figure 5 shows the percentage of the adequacy of the items that make up the checklist module on storage conditions and exposure of raw materials and products. When evaluating the risk of cross-contamination during food storage in food trucks, no nonconformities were found in 97% of establishments. Similar results were found in a study carried out by Cortese (2013), where 91% of the places stored food separately, without risk of cross-contamination.

The correct storage of raw materials, ingredients, and packaging, in a clean, organized place and on pallets and/or shelves, ensures adequate ventilation, cleaning, and protection against contaminants. Most establishments had a closet for storing raw materials (47%) and another 21% used pallets so that the products did not come into direct contact with the floor.

The legislation in force in the city of Rio de Janeiro also requires that perishable foods be stored under appropriate conditions and with the use of specific equipment, including in sufficient quantities, in order to guarantee adequate conditions for the conservation and distribution of cooled, frozen or heated foods (Rio de Janeiro, 2015). Nonconformities were found in the storage of perishable raw materials in 24% of the evaluated locations, mainly because they keep the products exposed at room temperature or do not have an adequate refrigeration system. Another 18% of establishments kept products out of the original packaging and without adequate identification with an expiration date.

When evaluating the risk factors associated with the sale of food by food trucks in California, Faw & Tuttle (2014) identified perishable foods being kept at room temperature in 44.21% of the locations, and in 24.21%, the equipment of refrigeration did not work. According to Alimi (2016), exposure of food at temperatures between 5 and 60 °C contributes to microbial development.

The lack of concern about temperature control during food handling can be explained by the results found by Samapundo et al. (2015). According to the author, most handlers interviewed did not know the use of refrigeration as a way to delay the growth of microorganisms.

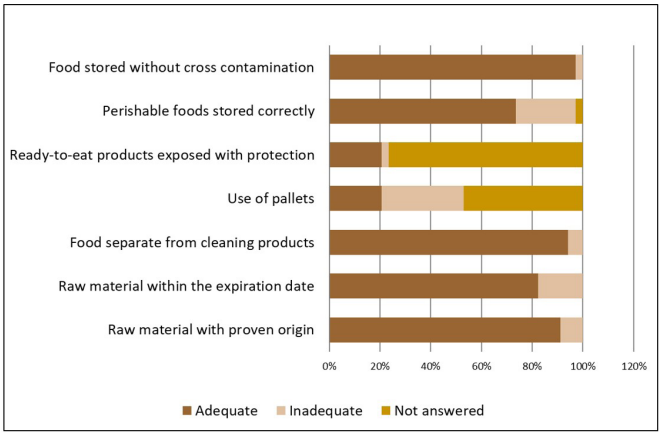

Figure 5. Percentage of adequacy of the items that make up the checklist module on storage conditions and exposure of raw materials and products in food trucks.

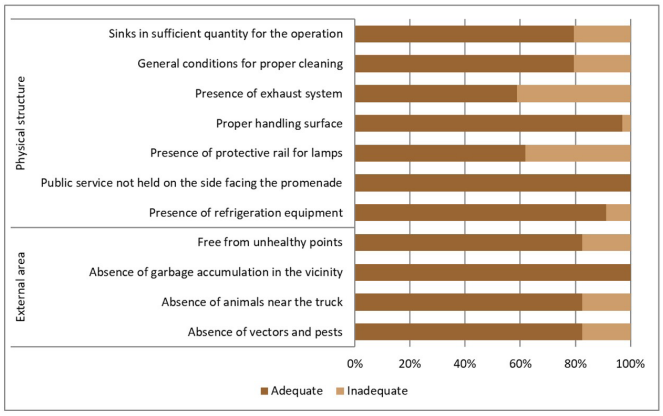

Figure 6. Percentage of adequacy of the items that make up the checklist module on the conditions of the point of sale in food trucks.

3.5 Hygienic-sanitary conditions

In the present study, in relation to the external area, it was found that 82% of the establishments met the adjustments for the absence of unhealthy and pest points in the vicinity of the truck. The non-conformities were related to the presence of pigeons and the accumulation of water near the parking place (Figure 6). Rane (2011) states that gutters can act as a breeding ground for flies and a place for the growth of microorganisms.

Concerning the physical structure, all the evaluated establishments respected the regulation of not serving the public through the side facing the sidewalk. Regarding the presence of an adequate handling surface (smooth, waterproof, washable), in correct conservation conditions, 97% of the food trucks complied (Figure 6). This makes these surfaces resistant to corrosion and free from cracks, roughness, and other imperfections, facilitating cleaning and preventing them from acting as sources of food contamination.

Some legislation in force, including the decree that supports the food truck segment in the city of Rio de Janeiro, makes it mandatory for food cooking places to be equipped with an exhaust system to capture odors and smoke. In about 41% of the evaluated establishments, the exhaust system was absent or awaiting maintenance. This ventilation ensures the renewal of air and the maintenance of the environment free of biological or physical hazards that may compromise the hygienic-sanitary quality of the food (Brasil, 2004; Rio de Janeiro, 2015).

According to the handlers interviewed, 71.43% of adapted vehicles are sanitized daily. The main sanitizer used to clean the food trucks' environment was the multipurpose disinfectant, followed by the detergent. The use of multipurpose disinfectants contravenes RDC 216/04, which describes that sanitizing products used in cleaning and sanitizing the environment must be stored in a place intended for this purpose, and the use of odorizing and deodorant substances is not authorized to prevent contamination of food (Brasil, 2004).

Water is used in many operations within an establishment that sells food, such as cleaning raw materials and ingredients, equipment and utensils, hands, as well as in cooking operations (Liu et al., 2014). In the text of the legislation of the city of Rio de Janeiro, there is an obligation for these vehicles to be provided with an "own and autonomous source, using potable water for the hygiene of hands, utensils, equipment, and benches" (Rio de Janeiro, 2015).

The presence of a sink supplied with drinking water was not observed in 18% of the adapted vehicles evaluated. Among those who had access to drinking water, most cited the state supply company as a source, followed by the use of gallons of mineral water (29%), which is allowed, since the legislation provides that "when there is no access to running water, appropriate, easy-to-clean, closed containers can be used for transport and storage".

When asked about cleaning the storage area, 74% reported performing adequate and periodic cleaning (Figure 7).

The solid and liquid waste generated must be collected by the commercialization points in its collection deposit and discarded later (Rio de Janeiro, 2015). Removal must be frequent with a deposit in a specific area to avoid contamination of food and the attraction of vectors and urban pests. The absence of collectors to capture waste causes them to be thrown into streets and gutters that act as a habitat for rodents, a breeding point for flies, and a medium for the growth of microorganisms (Rane, 2011).

Several studies report the reuse of water for washing utensils (Alimi, 2016; Rane, 2011; Liu et al., 2014). In this work, no water reuse was observed in any of the places visited in this study. It is worth mentioning that 91% of the trucks used disposable utensils in the distribution of food for consumption.

In a study carried out in the state of Espírito Santo, Brazil, from the verification of 200 trucks, 58% of them showed unsatisfactory conditions of hygiene, and 57% of the food samples produced proved to be unfit for consumption based on microbiological standards. These results underscore the importance of controlling food safety in street trucks (Ferrari et al., 2021).

3.6 Good handling practices

In several studies, food handlers are listed as the main ones responsible for food contamination due to the adoption of poor

hygiene and handling practices (Alimi, 2016; Faw & Tuttle, 2014; Liu et al., 2014; Rane, 2011). According to Campos et al. (2015), handlers act as an important factor in controlling hazards and providing safe food. According to Rane (2011), the personal hygiene of street food vendors is one of the main sources that contribute to microbial contamination. Therefore, positive results were verified in this study, where 91% of handlers had clean clothes and satisfactory personal hygiene, as shown in Figure 8. When evaluating the good food handling practices of food handlers who work in food trucks, 60% of the trucks revealed conditions for performing hand hygiene and antisepsis. The greatest inadequacies found to refer to the absence of an exclusive sink for hand washing, absent in all establishments.

In a study carried out in Bangladesh, it was observed that about 72% of street food handlers had satisfactory knowledge about food safety, but only 33% had practical attitudes in this regard, where the level of education exerted a significant influence. It was reported that 8.5% of handlers did not sanitize their hands after going to the toilet during the service period (Hossen et al., 2021).

According to Food and Agriculture Organization (2009), food handlers must wear clean work uniforms, maintained and replaced daily, in order not to contaminate food during its preparation and handling. The national legislation that deals with good practices also establishes the daily exchange of uniforms and also provides that they are used exclusively on the premises of establishments (Brasil, 2004). Among the places visited, in 29 trucks (82.8%) the handlers wore uniforms, and in 19 the uniforms were changed daily. However, despite its importance as a vehicle for contamination, 40% of respondents reported not removing their uniform when leaving the workplace.

On the other hand, despite a study carried out by Liu et al. (2014) verifying the presence of a health certificate among most of the food handlers interviewed (64%), in the present study this fraction included only 26% of the handlers interviewed.

The absence of correct hand hygiene procedures is worrying since it contributes to the increased risk of transmission of pathogenic agents in commercialized foods. According to Carneiro et al. (2017), the main limitation would be the availability of places for proper hand washing and the presence of paper towels.

In the present study, of the 35 handlers evaluated, only 40% sanitized their hands properly, combining antiseptic soap and white paper towels or liquid soap, white paper towels, and 70% alcohol or gel. In a study carried out by Souza et al. (2015) with street vendors, more than half of the respondents reported having the habit of washing their hands before handling food. However, a part (33.3%) used only water during this process.

The results found in the current study also showed that hand hygiene took place mainly at the point of sale (69%), but most handlers did not use an adequate procedure to dry their hands using material that may contain dirt – recycled paper towels (22). .8%), cloths/towels (17.1%), reusable cloth (8.6%) – or they did not dry their hands (2.8%). However, 60% described using some product after drying, being alcohol gel (45.7%) and alcohol 70% (14.3%) the most used.

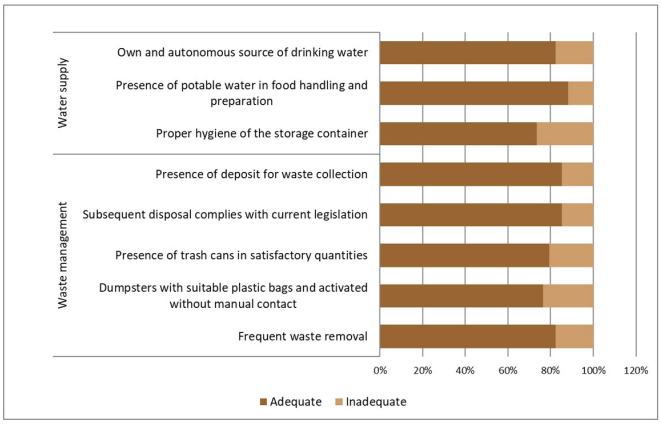

Figure 7. Percentage of adequacy of the items that make up the checklist module on water supply and waste management in food trucks.

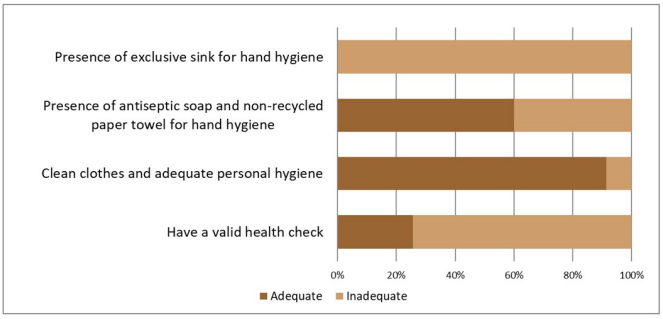

Figure 8. Percentage of adequacy of the items that make up the checklist module on the hygiene of food handlers who work in food trucks.

Despite the presence of sanitary facilities being required, it is notorious difficult of applying this imposition when we talk about the food truck segment. The structure of the adapted car does not include toilet facilities, forcing the user to use toilets available nearby or at the parking place. Of those interviewed, 92% reported using the toilets available in the parking lot (food parks, shopping malls) or commercial establishments close to the parking place. Cortese (2013) considers the lack of restrooms at points of sale as a risk factor since nearby places used by handlers do not always have a structure for washing hands before resuming food preparation activities.

Despite the mandatory training of food handlers, it was found that 62.9% of the employees who work in the food trucks interviewed in the present study were not trained in a food handling course. However, it was observed that the median time elapsed since the last course reported by respondents who had a food handling course was 6 months, with a range of 3 to 12 months, that is, it was identified that 46.2% of these handlers had taken the course for more than six months and had not renewed it.

This fact corroborates a study carried out by Liu et al. (2014), where only 6% of respondents had food safety training provided by competent authorities. Rane (2011) believes that educating food handlers acts as a control measure for food contamination.

Table 1. Proposal of essential operational requirements for the food truck segment.

Dimension	Proposed essential operational requirements
Installations	Presence of own source of drinking water supply
	Presence of deposit for collection of waste with correct later disposal
	Presence of an exclusive washbasin (to be equipped with a properly stocked paper and soap dispenser)
	Presence of equipment that allows proper conservation and distribution of cooled, frozen, or heated foods
	Presence of an exhaust system (to capture odors and smoke), in places where there is cooking
	Waste collectors in sufficient quantities and equipped with non-manual activation
Manipulation	Keeping perishable foods at the proper temperature
	Use of disposable utensils for product distribution
	Use of suitable substances for cleaning the environment of food trucks
	Training of handlers and managers in good handling practices with correct recycling
Controls/Documentation	Adequate sanitation of the water tank or container used as a reservoir with proper registration
	Adoption of monitoring procedures such as sample collection and temperature measurement with proper registration
	Training of handlers and managers in good handling practices with correct recycling
	Pre-establish the parking spaces, considering the absence of unsanitary points and the availability of available toilets
	Vehicle safety

3.7 Operational requirements

Essential operational requirements "eliminate or reduce a given hazard to acceptable levels" (Paula & Ravagnani, 2011). The present study proves that the absence of legislation that proposes standards for the food truck segment causes numerous existing non-conformities to become a risk. Cortese (2013) describes among these nonconformities the inadequate conditions of the place of preparation and storage (refrigeration or heating), lack of knowledge of hygienic handling techniques, lack of potable water, carelessness in the selection of raw materials, and inadequate practices during transport, handling, preparation, storage, and sale.

Considering the essential steps - cleaning, cooking, cooling, maintenance, and hot and cold distribution - for food safety described in NBR 15635:2015 (Associação Brasileira de Normas Técnicas, 2015) and the exposed results, some requirements were considered more relevant and essential for the segment of food truck and are proposed in Table 1.

4 Conclusion

Despite being widely appreciated for their flavor, diversity, low cost, and social role, food trucks still represent a challenge from a hygienic-sanitary point of view. There is a need for this segment to be recognized as an integral part of the commercialization of street foods and for specific legislation to be developed to support it since there is a growing increase in food trucks. The realization of new studies is essential for the monitoring of the competent regulatory agencies, in order to guarantee the safety of the individuals who use these places to carry out their meals.

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