Bake houses or bakeries that sell bread and confectionery products, despite offering a wide variety of products, have been increasingly involved in outbreaks of FD's (Foodborne Diseases) through pathogens, due to poor hygienic-sanitary conditions of the production sectors, also present in supermarkets with this segment. Therefore, the objective of this study was to evaluate the hygienic-sanitary conditions in the bakery sector of a supermarket in the city of Salgueiro-PE. The study period lasted one month, with the application of a checklist of GMP's (Good Manufacturing Practices) based on RDC 275, of October 21, 2002 of National Health Surveillance Agency (ANVISA), and applied to a total of 164 items distributed in five blocks: Edification and installation; Equipment, furniture and utensils; Operators; Production and transport of food; and Documentation. Subsequently, a calculation adapted from the resolution SSE/SUS – 196/1998 of the State of São Paulo was applied with the goal of proving the result obtained through the checklist. The establishment in general obtained an average percentage of 22.93%, classifying it in group 3 (0 to 50% of item compliance), considered bad according to RDC 275/2002. It was also considered the most defective block the operators, although all the others also presented incongruences. Through the calculation, the establishment obtained 21.4 points classifying it as deficient, therefore, there was no significant difference from the result obtained through the checklist, comprehending the need for implementation of quality tools.

Keywords: Panification. Hygienic-sanitary. Checklist.
(NHSA), evaluating 164 items distributed in five blocks: Edification and installation; Equipment, furniture and utensils; Manipulators; Production and transportation of food; and Documentation. Subsequently, a calculation was applied following the model of Resolution SSE/SUS - 196, of December 29, 1998 of the State of São Paulo, with the purpose of proving the result obtained through the checklist. The establishment obtained a general mean percentage of 22.93%, classifying it in group 3 (0 to 50% of compliance with the items), which is a group considered bad according to RDC 275/2002. The block of manipulators was considered the most defective one, although all the others also presented incongruities. Regarding calculation, the establishment obtained 21.4 points, classifying it as poor; therefore, there was no significant difference in the result obtained through the checklist, including the need to implement the quality tools.

**Key words:** Bakery. Hygienic-sanitary. Checklist.
INTRODUCTION
The National Health Surveillance Agency (NHSA) was created in the beginning of 1999, linked to the Ministry of Health (MH), with the aim of ending, minimizing or avoiding risks to people’s health, assuring excellent sanitary quality, through sanitary control of the production and marketing of products and services submitted to this agency, supported by various entities that have been training its teams, qualifying them for better identification of existing offenses in commercial establishments of foodstuff, instructing the owners and employees in relation to the hygienic-sanitary conditions, under the importance of the deployment of Good Manufacturing Practices (GMP), as well as from the Standard Operating Procedures (SOP’s), allowing the provision of a safe and quality product for the consumer.

The concept of quality and safety, therefore, refers to the food available for consumption that is safe and adequate in both nutritional as sanitary aspects. However, for the consumer, quality can relate to price, practicality, convenience, taste, smell, appearance and packaging. Many people are not even aware of the intrinsic condition of “Food Safety”, when referring to factors directed to the influence of this food in relation to the consumer’s health.

The production of safe and quality food seems an easy task, but represents a major challenge for sectors of food services. Even with technological advances in the areas of food production and quality control, the occurrence of Foodborne Diseases (FDs) has been growing annually.

According to the World Health Organization (WHO), annually, approximately 2.2 million deaths are attributed to the ingestion of contaminated food, of which 1.8 million occur in children aged under five years; even with this significant outcome that increases each year, most cases are not informed, due to the rapid symptoms caused by the etiological agents, so that individuals do not seek health services.

Bake houses or bakeries are companies that produce and sell breads and patisseries, characterized by commercial establishments of great movement and huge variety of products, containing a large demand by the population. Nevertheless, these sites have a growing involvement in outbreaks of FDs through pathogens, poor hygienic-sanitary conditions of production sectors, in addition to improper storage of raw materials and products, incorrect practices of personal hygiene and food handling. This situation is also commonly present in supermarkets with this segment.

According to the Health Surveillance Department, in the last decade, the main places of occurrence allusive with outbreaks of FDs were residences, followed by bakeries and restaurants. Therefore, it awakens doubts about the hygienic-sanitary conditions in the bakery sector and its main points of risk.

The non-compliance or absence of GMPs and SOPs probably results in problems regarding the hygienic-sanitary conditions, as well as storage, incorrect procedures of personal hygiene, among other factors. Once applied, they provide standardization of manufactured products, offering a safe and good quality product for the consumer. Likewise, the absence of a qualified professional contributes to such inconsistencies present in the bakery sector, in virtue of ensuring an innocuous product since the acquisition of raw materials up to the final consumer.

Therefore, it is interesting to analyze the fulfilment of improvement tools (GMPs and SOPs) regarding hygienic-sanitary conditions, identifying and quantifying the degree of appropriateness according to current legislation. The deployment of these tools allows controlling the whole production chain, analyzing, improving and describing all the procedures to be carried out in accordance with the legislation, since the physical structure of the company until the final purchase made by the consumer. It also instructs the owner or person responsible about the importance of a responsible technician, once this professional not only operates in the preparation of the offered products, but also trains employees that act directly and indirectly in the production chain, stating not only the integrity of the product, but also ensuring individual and collective health of consumers.

Nonetheless, the company can also see these tools as disadvantages regarding the financial cost, but it should understand it as an investment due to the various inadequacies present and epidemics caused in commercial establishments of foodstuff in this segment, as shown by studies.

Still, the demand for the products offered in bakeries has been increasingly higher. However, the adequacy of bakery sectors, in relation to food safety, providing a safe product for the consumer, became crucial. Therefore, this study aims to evaluate the hygienic-sanitary conditions in the bakery sector of a supermarket in the city of Salgueiro-PE.

METHOD
The development of this work consisted of a descriptive/exploratory and quantitative study, occurring during the period from 28 December 2015 to 29 January 2016, in a bakery sector of a supermarket in the municipality of Salgueiro-PE, located in Sertão Pernambucano, with an area of 1,686.815 km², 518 km far from the state capital, Recife, and an estimated population of 5,769 inhabitants, with a demographic density of 33,57 hab./ km².

The study objective was to analyze the hygienic-sanitary conditions in the bakery sector, focusing on buildings and facilities, equipment, furniture and utensils, handlers, production and transport of food and documentation.

For data collection, a letter requesting authorization was initially sent to the supermarket manager. After authorization, the GMP checklist was applied based on RDC 275, 21 October 2002 of the NHSA divided into three parts: company identification, evaluation and classification of the establishment. The hygienic-sanitary conditions checklist of the chosen sector consisted of 164 checklist items distributed in five blocks, as described in Frame 1.

<table>
<thead>
<tr>
<th>N. of items</th>
<th>Classification of blocks</th>
<th>Assessed Items</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Frame 1: Classification of blocks and items assessed in each block.
Buildings and Facilities

- Building location and conditions, floor, ceiling, walls, doors, windows, stairs, sanitary facilities, washbasins, lighting, ventilation, cleaning of facilities, integrated control of vectors and pests, water supply, waste management, sanitary sewage and layout.

Equipment, Furniture and Utensil

- Number suitable for branch, conservation, operation, spreadsheets, records, proper storage and hygiene.

Handlers

- Clothing, hygienic habits, health status, health control program, personal protective equipment and handler training and supervision program.

Food Production and Transport

- Raw materials, ingredients and packaging, production flow, final product quality control and final product transportation.

Documentation

- GMP Handbook, SOPs and food gathering programs.

The checklist still included a space for comments, with the purpose of describing the inadequacies found.

Firstly, the assessment occurred according to the scoring criteria established by RDC 275/2002, classifying the establishment in: Group 1 (76 to 100% of items), Group 2 (51 to 75% of items) and Group 3 (0 to 50% of items). The method of percentages was used for classification of items as compliance (S), no compliance (N) and not applicable (NA), providing a score to each block and then summing all the blocks to obtain the average.

Later, with the purpose to prove the result of the checklist, a calculation (Equation 1) was adapted following the model of the SSE/UHS - Resolution 196 of 29 December 1998, of the state of São Paulo, checking the values assigned to each block individually, through the following formula:

\[ PB_n = \frac{TS_n}{K_n - TNA_n} P_n \]  
(Equação 1)

Where:
- \( n \) = number of the block (n= 1, 2, 3, 4 or 5);
- \( PB_n \) = Block Score;
- \( TS_n \) = Sum of the YES scores obtained in each block;
- \( TNA_n \) = Sum of not applicable scores obtained in each block;
- \( K_n \) = Constant of each block (With K1=60; K2=50; K3=32; K4=24; K5=53);
- \( P_n \) = Weight of each block (With P1=10; P2=15; P3=25; P4=20; P5=30).

For the application of the formula, the classification of each block and checked items remained according to Table 1. Each block has a corresponding weight (P) and constant (K).

The score of the establishment was performed according to Table 1. Each block has a corresponding weight (P) and constant (K).

<table>
<thead>
<tr>
<th>Blocks</th>
<th>Specific Weight</th>
<th>Constant (K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>P1=10</td>
<td>K1=60</td>
</tr>
<tr>
<td>2</td>
<td>P2=15</td>
<td>K2=50</td>
</tr>
<tr>
<td>3</td>
<td>P3=25</td>
<td>K3=32</td>
</tr>
<tr>
<td>4</td>
<td>P4=20</td>
<td>K4=24</td>
</tr>
<tr>
<td>5</td>
<td>P5=30</td>
<td>K5=53</td>
</tr>
</tbody>
</table>


According to the methodology presented, there were five partial notes for each block, summing them all (P1 + P2 + P3 + P4 + P5), classifying the establishment according to the score (P) obtained in Table 2.

Table 2: Supermarket classification according to the score obtained.

<table>
<thead>
<tr>
<th>SCORES</th>
<th>CLASSIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 60</td>
<td>Poor</td>
</tr>
<tr>
<td>61 - 80</td>
<td>Regular</td>
</tr>
<tr>
<td>81-90</td>
<td>Good</td>
</tr>
<tr>
<td>91-100</td>
<td>Excellent</td>
</tr>
</tbody>
</table>


RESULTS AND DISCUSSION

The results obtained with the application of the checklist adapted from RDC 275/2002 showed a large number of non-complied items distributed in five blocks, as shown in figure 1.

The first block analyzed (building and facilities) presented several non-compliances. In the area outside the company, there were objects in disuse, accumulations of...
garbage, as well as the presence of insects and other animals, including near the production area. Although they asserted owning a service sent to an outsourced company specialized in adoption of chemical control in conjunction with control of vectors and urban pests, this problem was not solved.

The inside doors and the elevator used for transportation of the products were made of wood, preventing proper hygiene, while the windows of smooth surfaces did not contain millimetric screens or another system, making them a great source of contamination. The floor and the walls allowed a proper hygiene, even without convex angles and grids to facilitate the disposal, with only drains in insufficient quantities, not satisfying the need of the sector.

Thus, the external and internal areas should be maintained in hygienic conditions, protecting the food. Including waste removal, adequate drainage, projects for facilities helping in maintenance and cleaning operations, avoiding, in this way, the entry of insects, rodents, among others. Therefore, the ease of cleaning and sanitizing should always be considered in the installation plan.

![Figure 1: Percentage of compliance analysis](image)

The sanitary facilities, even isolated from the production area, independent for each sex (as specific legislation), and identified, had many irregularities. The bathrooms were not for exclusive use of food handlers; the number of urinals and washbasins was inadequate in proportion to the number of employees (as specific legislation); Sanitary facilities served by flowing water, with taps with manual actuation; doors without automatic closure; inadequate lighting and lack of ventilation; lack of hygiene system for drying hands and lack of warnings with the procedures for hand washing, similar in the manufacturing sector.

The company had no locker rooms, as well as lockers for food handlers, reason for handlers to be already dressed with the uniform from their residence.

The bathrooms should be specific for food handlers, with lighting and ventilation, according to the law, with sanitary conditions, hand hygiene facilities with notices, provided with appropriate elements (liquid soap, detergent, and disinfectant, among others), guiding and encouraging employees. The locker rooms are mandatory and must have individual lockers for easy cleaning, preferably made of metal, featuring internal divisions that separate clothes and footwear used for the development of activities.

The electric lighting used in the production suited the activities, with protection against breakage, and in a good state of conservation. However, there were exposed electrical wiring, not coated by piping insulation and stuck to walls and ceilings. In a study performed by Leite et al. evaluating the hygienic-sanitary conditions in the sectors of manipulated products in supermarkets, they were much more critical, because the lighting was inadequate in 100% of the bakeries.

The ventilation and air conditioning showed considerable inconsistencies in the bakery sector, because they did not ensure thermal comfort. There were only fans that did not comply with the needs of the sector, besides not having an exhausting or inflating system with air exchange capable of preventing contamination. Due to this problem, the staff worked with doors and windows open, putting at risk both the handler’s health as the food quality and safety, once the law imposes ventilation and air conditioning appropriate to the establishment.

Regarding the hygiene of the facilities, there was no qualified person responsible for the operation and the frequency of hygiene was irregular, without records that proved this action. The products did not have a proper place for storage. Nevertheless, the hygiene products complied with the

DOI: http://dx.doi.org/10.19095/rec.v7i1.387
Ministry of Health, following the instructions recommended by the manufacturer.

In this block, the water supply of the company was also assessed, the establishment used treated water from public supply, with satisfactory water tanks and hydraulic installations, but the company had no registration or proof of the sanitation of reservoirs, as well as of physical-chemical and microbiological analysis of water. In a survey conducted recently by Maciel et al. assessing the good manufacturing practices in bake houses of the city of Marabá, Pará, Brazil, a small-sized bakery and a mid-sized bakery used water from the public network, without monitoring its quality through analyses.

The waste management was quite unsatisfactory, even with frequent waste removal from the processing area, preventing contamination sources, the bins with pedal were broken and did not meet the demand in the sector, using cardboard boxes, related to the area of waste storage, they were placed at the door where foods were received. Diverging from the requirements of the legislation, in which the establishment must have intact containers, identified, of easy hygiene and transport, in sufficient number and capacity to contain the waste and with caps open without manual contact, stored in a closed and isolated place in order to prevent contamination sources and attraction of vectors and urban pests.

Finally, the assessment of the layout of the company showed that the distribution of the premises according to the activity did not comply with the demands of the productive process.

The second block examined (Equipment, furniture and utensils) obtained a high index of conformities (Figure 1). The equipment observed in this block pointed to an appropriate number in accordance with the production, allowing easy access and adequate hygiene, although some needed maintenance. The furniture and utensils also presented similar failure, but did not have a sufficient amount according to the needs of the manufacturing sector.

As for the conservation equipment, there were no spreadsheets to record temperature, preventive maintenance, calibration or proof of execution when performed by outsourced companies. According to Motta et al., most FDs result from the lack of an effective control on the temperature of the equipment and preservation of food products.

With respect to the hygiene of equipment and machinery, furniture and utensils, all products used in the cleaning complied with the Ministry of Health and were identified, but the company did not have all products necessary for the process, and their storage occurred in a space intended for foods, putting them at risk of chemical contamination. Moreover, there was no qualified professional responsible for performing the operation. The poor hygiene frequency, or its improper development, probably resulted from the absence of such professional, thus without records of the sanitation.

Due to these irregularities, the percentage of non-complied items was quite high. Although this result was not satisfactory, in a previously mentioned study by Marques et al. in the bakery sector of a supermarket, it was much worse, in which, in the implementation of the checklist, the block presented 100% of non-compliance.

The third block (Handlers) had fewer items assessed in relation to the other; however, did not have few non-conformities. In the evaluation of non-complied items, there was absence of PPE, such as lack of ear protectors. The incomplete and quite worn out uniform of collaborators forced them to make use of their own clothes, not exclusive of the production sector, and this failure led employees to wear any clothes they wanted to in the production area, including footgear, in which some were wearing sandals.

According to Mota et al., a similar study, when verifying the SOPs and GMPs in five bakeries in the cities of Crato and Juazeiro do Norte-CE, also identified the lack of adequate use of uniforms and PPE, as well as incorrect hygiene habits, being the main responsible for the low percentage of conformities in relation to handlers in most areas. In the same way, Schimanowski and Blümke, when assessing the suitability of Good Manufacturing Practices in bakeries in the municipality of Ijuí-RS, showed incomplete uniforms in 100% of the locations surveyed and handlers using adornments in 60% of the sites investigated.

In this block, there were also food handlers using adornments (ring, earrings, piercing, etc.), strong perfumes and makeup; as for the nails, they all kept in appropriate size, however, some used to make use of base coat. Almost all handlers had short beard, only a single employee insisted on keeping it long. Even in the midst of so many troubles, at least all employees used headdresses protecting the hair. Similarly, a study conducted by Pantoja et al. on Good Manufacturing Practices in the bakery sector of a unit of military food and nutrition of the city of Belém, PA, showed the presence of adornments, incorrect hand hygiene, among other bad habits.

Thus, the handlers must wear preserved and clean uniforms, should not smoke, sing, talk unnecessarily, eat, handle money or commit other acts that might contaminate the food during their work. Their hairs must always be tied back and protected by headdresses or other appropriate attachment for this purpose, beards are not allowed; hands should be washed before and after any interruption of service, containing fixed posters about proper hygiene and other hygiene habits.

With respect to collaborators, their health status was “apparently” good, but there was no periodic supervision through exams, which only happened when hiring an employee (admission exams), with the existence of records of examinations in the company. According to Mota et al. previously mentioned in this same block, when checking the SOPs and GMPs in five bakeries in the cities of Crato and Juazeiro do Norte-CE, 80% of the establishments lacked regular medical exams for handlers. Differing from Sá et al. that, when analyzing five bakeries in the municipality of Araguari-MG, found that 80%, in addition to the admission examinations of employees, also performed periodical examinations.

The food handlers need to undergo admission examinations to assess whether they are suitable to perform the activities. Exams must occur every six months or at least annually to monitor employees’ health and resigning exams to observe any change in their health status. These exams are of extreme importance for both the employee as the company, because they are the only way of knowing if the employee is or is not an apparent or unapparent bearer of infectious or parasitic diseases.
In relation to qualification programs for food handlers, there was no training nor any proven qualified supervisor during the activities developed in the sector, as well as to employees’ habits of personal hygiene. However, a handler reported having previously training in another company on GMP’s, but did not put into practice, unlike the head of the bakery sector who reported having training on GMPs and practicing them, however, without any success, regarding his assistants.

The lack of training of food handlers and a qualified professional explains these non-compliances, since training courses provide information and raise awareness in the handler, helping to change their hygiene habits when performing their tasks. Reinforcing this thought, Santos et al., when evaluating the hygienic-sanitary conditions of three bakeries located in the municipality of Lago dos Rodrigues - MA, found that employees were unaware or neglected the correct adoption of the practice of hygiene, emphasizing the importance of supervision and periodic training of food handlers in food hygiene, a practice identified in only one of the evaluated bakeries.

The fourth block (Food Production and Transport) presented the lowest percentage of non-conformities in relation to the others. Nonetheless, there were still several inconsistencies, such as in the reception of raw materials, ingredients and packaging, where there was garbage near the reception door. However, raw materials, ingredients and packaging were always inspected at their reception, awaiting the release and, when approved, were identified. The disapproved ones were immediately returned or identified and stored in a separate location for later return.

All labels of raw materials and ingredients complied with the legislation and the criteria established for their selection always based on food safety, respecting the order of entry and observing the expiration date. Nevertheless, the storage of raw materials and ingredients was not adequate, since the site was inappropriate and disorganized, because the area reserved for this purpose did not have enough space, being a part stored in the stock of other goods from the supermarket, occurring the same with packaging, Maciel et al., when assessing the good manufacturing practices in two bakeries, obtained a similar result in one of the bakeries, while the other had a satisfactory outcome.

The cold network, although appropriate to the volume and the different types of raw materials and ingredients, had no organization nor regular hygiene. The raw materials, ingredients and packaging shall be stored in a clean and organized place, in order to ensure protection against contaminants. Subsequently, the labelling and storage of products already prepared in the bakery sector were assessed, detecting positive points. Among them: labelling with visible identification and in accordance with the legislation; final product packaged in suitable and undamaged packaging; absence of foreign, rotten or toxic material. However, the inadequacies were well above, with food stored in PVC boxes on the floor; inefficient hygiene; damaged products, outside expiration date, next to others within expiration date and without identification; absence of final products or in quarantine awaiting outcome; cold chain “sometimes” incorrect to different types of foods produced in the bakery sector; and products that should be stored under refrigeration, exposed to ambient temperature until the purchase by the final consumer.

A study conducted by Vieira and Cotta, evaluating the hygienic-sanitary profile in a bakery of Sete Lagoas-MG, identified a totally inadequate quality control of the final product, compromising the integrity of the final product.

Finally, the quality control of the final product lacked (physical-chemical or microbiological) analyses, assessing the final quality of the product. Regarding transport of the final product, it was not applied to the establishment, once it sold directly to the consumer. However, this block obtained lower conformities in relation to other blocks, which may have resulted from a percentage of 22.21% corresponding to “not applicable”.

In the fifth and last block evaluated (Documentation), there were more than half of non-complied items in the bakery sector, identifying the lack of Manual of Good Manufacturing Practices and Standard Operating Procedures (SOP’s). Consequently, 44.44% of the evaluated items did not apply to the bakery sector, resulting in a single item correct. Corroborating Ananias et al., who, when assessing five bakery industries of the city of Goiânia-GO, showed that the same block also presented 0% of conformities, occurring the same with Costa et al. who identified that all three bakeries assessed had no documentation and record.

In a more recent study conducted by Maciel et al. in a small-sized bakery and in a midsized bakery, the midsized had a percentage of 60% of compliance, while the other had 0%, being classified as bad, since it had no responsible technician, handbook of good practices nor permission to operate.

The establishment obtained a general average percentage of 22.93%, classifying it in group 3 (0 to 50% of items), according to RDC 275/2002, which is considered bad. In relation to the evaluated blocks, the most impaired block was of handlers; however, with the purpose to certify the result precisely by the checklist, a calculation was adapted following the model of the SSE/UHS - Resolution 196 of 29 December 1998, of the state of São Paulo.

With all blocks examined, the grades were much lower than the maximum grade, as shown in Table 3.

Table 3: Individual scores obtained of each assessed block and the total score of the establishment.

<table>
<thead>
<tr>
<th>Blocks</th>
<th>Scores of the Blocks</th>
<th>Maximum Possible Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Building and Facilities</td>
<td>5.1</td>
<td>10</td>
</tr>
<tr>
<td>2- Equipment, furniture and utensils</td>
<td>1.8</td>
<td>15</td>
</tr>
<tr>
<td>3- Handlers</td>
<td>1.6</td>
<td>25</td>
</tr>
</tbody>
</table>

DOI: http://dx.doi.org/10.19095/rec.v7i1.387
The score of blocks were also identified according to the results acquired by the checklist of RDC 275/2002. The building and facilities block, even with a score smaller than that of food production and transport, the block still remained with the best score of compiled items, once it reached a score closer to its maximum weight. The block equipment, furniture and utensils, achieved a score too far from its maximum, losing only to the block of handlers, which, besides having the lowest score, had a much higher maximum score. With respect to the block of documentation, its score was zero, since, as already mentioned, there was no documentation. Thus, through the total score of the blocks, the establishment can be classified as deficient, without significant difference in the result of the checklist.

**FINAL COSIDERATIONS**

The results obtained by the application of the checklist show that, regardless the index of compiled items presented in each block individually from the bakery sector, they all presented several irregularities in disagreement with the current legislation. Nevertheless, the block of handlers presented most inconsistencies, being essential to train food handlers, as well as administrative management, who showed concern about the expenses to remedy the non-compliances presented, instead of thinking as an investment to the establishment. In this way, hiring a qualified professional in the area would help to correct and prevent problems with regard to the hygienic-sanitary conditions of the establishment.

**REFERENCES**


20. Pantoja RM, Vidal GM, Costa LCF, Mendonça XMDF. Boas Práticas de fabricação no setor de panificação de uma unidade de alimentação e nutrição militar da cidade de Belém, PA. Revista Higiene Alimentar, São Paulo-SP: Mai./Jun 2012; 26 (208-209),


DOI: http://dx.doi.org/10.19095/rec.v7i1.387