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Control of temperature storage and distribution of food in commercial restaurants of a public education institution

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Abstract

This study aimed to evaluate the storage and distribution temperatures of foods in commercial restaurants in a public educational institution located in the city of Belo Horizonte, State of Minas Gerais, Brazil, and verify its conformity with the legislation. A digital infrared thermometer was used; data collection was performed in six restaurants for storage (chilled and frozen) and 11 for distribution of hot and cold preparations. In this stage, measurements of temperatures were taken immediately after completion of the preparations and every 30 minutes, for a total period of 90 minutes (four measurements / day) in three non-consecutive days. Among six restaurants assessed, four and five had adequate temperature for storage of frozen and chilled foods, respectively. Regarding distribution, only one had preparations at adequate hot temperature; all units were inadequate for cold preparations. It was concluded that monitoring of temperature at the serving line is essential to the quality of the meals and it is urgent to implement control mechanisms in order to minimize the risk of contamination.

Key words: Quality Control. Temperature. Restaurant. Food Handling.

Introduction

The foodservice industry is constantly growing in Brazil and its economic importance can be expressed in direct jobs generation, the number of meals produced, the increased economic activity resulting from the commercialization of meals and foods consumption, which represents to the government revenues of one billion reais of taxes and contributions. In 2012, the foodservice market generated a sales volume of R$ 14.7 billion, up 13% from previous year, a result from 11 million meals served by the firms in this business. [1]

Among various aspects related to the increasing demand for outside-of-the-home food services, the sanitary quality of the products offered still represents a fundamental issue, especially if we consider the size of the population served. [2,3] Thus, several procedures should be adopted to ensure an adequate final product free from pathogenic agents, such as the purchase of non-contaminated raw materials, appropriate handling and hygiene practices during preparation, efficient equipment and operational structures, and qualification of food handlers.[3-8]

In this context, we highlight the importance of maintaining proper temperatures in the diverse production stages, which directly impacts on the microbiological quality of the meals.[7,8] So, in order to guarantee the quality of the meals, it is vital to pay attention to the "time and temperature" relationship, a very important factor in the meals serving line. In various restaurants, the preparations are held on the thermal display cases for a long time and, in most cases at improper, unsafe temperature, influencing decisively the increase of the microbial activity.[9]

This work aimed to assess the storage and distribution temperatures of foods in foodservice units at a public educational institution and their compliance with the current legislation.

Methodology

This is a descriptive and observational study conducted at commercial restaurants in the campus of a public educational institution in Belo Horizonte-MG. All 21 restaurants existing in the campus were invited to participate in the study. However, only six units agreed to participate in the assessment of storage temperatures, and 11 units of distribution (or serving line) temperatures. All participants responsible for the unit signed the Free and Informed Consent Form.

The storage temperatures [8,10,11] of refrigerated products (milk and other dairy products, sausages, sandwiches, sauces, fruits, vegetables and meats) and frozen foods (meat, fish, processed foods, vegetables, sausages, pasta and salty pastries) were measured on three non-consecutive days in six restaurants, following prior authorization of the manager of the unit. Such evaluation was made in triplicate aiming at assessing all food suppliers as well as the largest possible diversity of the products delivered to the unit.

For cold preparations (greens, leafy and other vegetables) and hot dishes (rice, beans, meats, *farofas* [toasted manioc flour mixtures], vegetables and pastas), temperatures were measured[8,10,11] immediately after cooking was completed and every 30 minutes during 90 days (four measurements/day) in three nonconsecutive days, in 11 restaurants. Also, the type and amount of equipment available and used to hold the temperature of the foods were examined.

For data collection, a digital infrared thermometer with temperature range of -49°C to 230°C was used at a distance of 20 cm from the center of the foods.[5,7,10-12] Finally, each cafeteria's average, mean and standard deviation of all establishments under assessment were calculated, as well as the minimum and maximum temperatures, and the results were compared with the current legislation.

Results and discussion

In the evaluation of temperatures of the refrigerated and frozen foods, it was observed an adequacy of 83.3% (n=5) in the restaurants, as recommended by the *ABERC Manual*,[10] with temperatures lower than 6°C for meats and 10°C for the other refrigerated products and -18°C for the frozen products.

With respect to the temperatures of cold preparations, inadequacies were observed in 100.0% (n=11) of the assessed restaurants, i.e., above 10ºC, according to RDC nº 216/2004[11] (Table 1). The overall average among the restaurants was 20.8°C (±3.0°C), and the minimum and maximum values were 17.0°C and 24.5°C, respectively, showing a great variation among the units assessed.

These results may have occurred because of cooked foods included in the salads, which were prepared near the serving time and without undergoing proper refrigeration. Furthermore, the lack of proper temperature control at the refrigerated display cases may have contributed to these results.

According to CVC Ordinance no. 05/2013,[12] these preparations may reach temperatures from 10°C to 21°C for a maximum of two hours. Six restaurants were in conformity with this regulation.

Other authors analyzed the temperature of cold preparations served in commercial restaurants. Alves & Mesquita,[13] in a study conducted in Santa Maria-RS, found inappropriate temperatures, especially in salads. This was because of excessive proximity to ovens and stoves, which caused the temperature to rise. In another study, Marinho et al.[9] observed inappropriate temperatures of cold preparations in a large-sized foodservice unit located in Belo Horizonte-MG, which was associated with excessive handling time and insufficient refrigeration time prior to serving, as observed in this study. Carvalho et al.[14] evaluated three commercial restaurants in Goiânia-GO and also found unsatisfactory results in ready-to-serve cold preparations.

Regarding the hot preparations, it was observed that only in one cafeteria (9.0%) proper temperatures were found, at or above 65ºC, as prescribed by RDC no. 216/2004[11] (Table 1). In other three units (27.0%) proper temperatures were only found in one of the days of evaluation, and the others (n=7, 64%) presented inappropriate temperatures in all days.

The overall average in the restaurants was 56.0% (±7.1), and the minimum and maximum values were 42.4ºC and 69.4ºC, respectively, showing a great variation among the establishments surveyed. The factors that likely contributed to this variation among the restaurants were lack of control of holding/serving temperature, inadequate heating equipment and lack of control.

According to Ordinance CVS05/2013,[12] hot foods can be held in the serving line at a temperature of 60ºC or higher for six hours at the most, and below 60ºC for up to one hour. According to these parameters only three restaurants were found at proper temperatures.

In some restaurants, the standard deviation was high. This can be due to the menu specificities at the day of evaluation, as well as deficient hot-holding equipment and hot display cases.

Table 1. Mean values and standard deviation of temperatures (ºC) of cold and hot preparations after been cooked at commercial restaurants at the campus of a public educational institution. Belo Horizonte-MG, 2012.

Restaurants	Preparations	
	Cold	Hot
1	19.7 (±1.3)	49.5 (±0.8)
2	24.5 (±0.4)	52.4 (±6.2)
3	24.4 (±1.2)	42.4 (±3.4)
4	18.0 (±0.5)	61.6 (±1.5)
5	24.0 (±0.2)	53.6 (±4.4)
6	20.7 (±0.5)	69.4 (±1.7)
7	21.6 (±0.6)	59.8 (±7.8)
8	17.5 (±0.5)	55.7 (±11.9)
9	23.5 (±1.3)	52.9 (±4.4)
10	17.6 (±4.5)	57.2 (±3.7)
11	17.0 (±1.8)	61.0 (±14.9)

Similar results were found by Frantz et al.,[15] when they evaluated documented processes in a foodservice unit. They found, in general, that hot preparations showed more appropriate temperatures than cold preparations.

Barbieri et al.,[16] in a study conducted at a foodservice unit located in the southern area of Rio de Janeiro-RJ, concluded that the temperature of meats and garnishes in the serving line were sometimes lower than the safe temperature due to factors such as the early preparation of foods for replacement and not stored appropriately.

Chesca et al.,[17], when they evaluated the temperatures of cold and hot meals at the serving line in restaurants in Uberaba-MG, observed that 25.0% of hot preparations were below 60ºC.

In a study by Soares, Monteiro & Schaefer,[18] control of the serving time of hot dishes in a university cafeteria indicated that all meals met the requirements set out by Brazilian legislation, because even those with inappropriate temperatures were not displayed for consumption for a period of time no longer than that recommended by CVS-6/1999.[12]

Finally, in general, equipment such as industrial pass through, water bath or refrigerators as well as preventive maintenance programs contributed to reduce and/or keep the temperature of cold and hot preparations in the serving line in addition to the processes of temperature control.

One of the limitations of this study was the strong resistance of the employees of the units in permitting the collection of data, arguing that it would interfere in the routine activities of the cafeteria.

Conclusion

The proper temperature either in storage or distribution (serving line) is one of the factors that contribute to ensure the quality of the meals served. For this reason it must be constantly monitored to minimize the risks of contamination and microbial growth and improve the quality of the preparations served in restaurants and restaurants.

Daily control procedures and corrective or preventive measures must be provided so as to promote proper temperature monitoring.

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