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Microbiological analysis of salads eaten raw in the cafeteria of an Educational Institution

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ABSTRACT
The National School Feeding Program (PNAE) is a Brazilian public policy that aims to ensure adequate nutrition for basic education students in public and philanthropic schools. Implemented since 1955, the PNAE's main objective is to meet the nutritional needs of students during school, contributing to their development, learning and academic performance. However, concern about the quality of vegetables eaten raw, which are essential for a healthy diet, is relevant due to the risks of contamination by pathogenic microorganisms, which can occur at various stages from production to consumption. The study described here specifically analyzes raw salads consumed by students, evaluating microbiological aspects to ensure food safety in the Vitória da Conquista campus cafeteria, using total and thermotolerant coliform counting methods.

Keywords: Student cafeteria, Raw salads, Microbiological analysis, Infectious diseases.

INTRODUCTION

The National School Feeding Program (PNAE) establishes criteria for the management of school feeding, the School Feeding Council, school canteens and kitchens, and the work of nutritionists and educators at school (CONCEIÇÃO, 2015; BRAZIL, 2009a).

In this sense, the PNAE, implemented in 1955, is a public policy and aims to transfer financial resources to guarantee school meals for students in all basic education, early childhood education, high school, and youth and adult education enrolled in public and philanthropic schools, to meet the nutritional needs of these students during their stay in the classroom, contributing to growth. the development, learning and academic performance of students, and focuses on the formation of healthy eating habits (BRASIL, 2009b; CECANE PARANÁ, 2010).

The consumption of vegetables is fundamental and should be part of any family's menu. It occurs due to its nutritional value due to vitamins, minerals, fibers, low caloric intake and the fibers contained in them (NASCIMENTO et al., 2005). It is noteworthy that the general population has changed its eating habits regarding the consumption of fresh vegetables (OLIVEIRA et al., 2006).

It should be noted, however, that vegetables consumed raw are responsible for the transmission of enteric diseases. Contamination occurs in the vegetable garden, through the use of irrigation water or inadequate fertilizers, in transportation or by manipulation at points of sale; and successive manipulations

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increase the chances of contamination (TAKAYANAGUI, 2001).

This contamination is due to the presence of a group of coliforms and one of them is bacteria of the total coliform group. The other group, fecal coliforms (coliforms at 45º C or thermotolerant) in food, indicates the hygienic-sanitary conditions of the product and a better indication of the possible presence of enteropathogens (FRANCO; LANDGRAF, 2008).

The concern with the quality and safety of food is a global public health issue, due to the possibility of ingestion of some type of food contaminated by pathogenic microorganisms (CUNHA, 2006). Vegetables that are consumed raw are probable sources of these microorganisms and attention should be paid to countries where sanitation is precarious (ALMEIDA FILHO, 2008).

Its main objective is to analyze the salads eaten raw by the students, prepared in the cafeteria of the Vitória da Conquista campus, from the microbiological point of view.

MATERIALS AND METHODS

For the collection of salad samples, a plastic container with a lid was used, exclusively for this purpose, i.e., to store the samples. They were then stored in a Styrofoam box containing an ice sheet and immediately transported to the laboratory.

The analyses were carried out by the server Dr. Roseane Machado, coordinator of the food and water laboratory, at the University of Southwest Bahia/UESB, Vitória da Conquista campus, This laboratory represents a reference for the municipality and region.

The methodology established in the UESB laboratory for the counting of total and thermotolerant coliforms (450C) was used the technique of the most probable number-MPN. For the serial decimal dilution of the samples, the first dilution (10-1) of 225 ml of diluent (0.1% peptone water) was performed, plus 25g of the sample and homogenized. Then, 1 ml of the first dilution was transferred to 9 ml of the same diluent for the preparation of the second dilution (10-2), for the preparation of the third dilution (10-3) The same procedure was performed, transferring 1 ml of the second dilution to 9 ml of diluent, totaling three dilutions.

For the total coliform count, 1 ml of each dilution was added to test tubes containing 10 ml of Lauryl Sulfate Tryptose Broth (LST). The tubes were incubated in an incubator for 48 hours at 35°C, after which it was observed whether there was gas production and turbidity of the tubes. From each tube with gas production, a loaded elevation of each culture was transferred to tubes containing 2% Bright Green Bile Broth (VB) and incubated in an incubator at 35ºC for 48 hours. VB tubes were observed with gas production and turbidity, meaning the presence of total coliforms (APHA, 2015)

On the other hand, the thermotolerant coliform count was made from the LST tubes with turbidity and gas production, where a loaded elevation of each culture was transferred to tubes with ***E. coli*** broth

(EC). They were then incubated in a water bath at 45ºC for 24 hours, followed by the number of EC tubes with gas production, confirming the growth of thermotolerant coliforms (APHA, 2015).

The results were analyzed, based on the dilutions and the number of positive samples of the confirmatory test, then compared with the MPN table of the *Bacteriological Analytical Handbook.*

FINDINGS

The results of the total coliform and *E. coli* analyses, performed on the salads served to the students, can be seen in Table 1. It is observed that the results obtained indicate that the 4 samples analyzed (100%) were outside the microbiological standards established in Normative Instruction No. 60/2019, since the sanitary conditions are unsatisfactory for human consumption, due to the analytical results being above the established limit. Regarding total coliforms, 4 (100%) of the samples were without hygienic sanitary conditions. Regarding *E. Coli* 3 (75%) they were well above the established current standard, which indicates that at some stage of the handling of the vegetables there was fecal contamination in the food, thus, the result points to information about the hygienic conditions of the salads.

Data from the studies by PALÚ et al. (2002); PAULA et al. (2003); JUNIOR et al. (2012) are similar and corroborate in their similarity with the results presented. They describe the presence of total coliforms and *E coli* in samples of lettuce, compost and mayonnaise salads. All of them affirm that, due to hygienic-sanitary failures throughout the preparation process, raw meals promote food insecurity. Research conducted in daycare centers and schools in other states also found.

Table 1. Microbiological analysis in raw salads served in a restaurant, from a Higher Education Institution in Vitória da Conquista (BA) 2023.

Samples	Coliforms Totais NMP/g VMP2 – Instruction Regulations N° 60/2019 Not referenced	Escherichia coli NMP/g VMP2 - Normative Instruction Nº 60/2019 10
O	1100	210
B	3,6	Absent
C	150	93
D	150	93

Source: Survey data, 2023

FINAL CONSIDERATIONS

With the evaluations of the salads, even though it was a preliminary study, it was found that the restaurant of the higher education institution provided the students with raw salads with a high count of microorganisms such as total coliforms and *E. Coli,* which can compromise the health of the students. The results indicate contamination caused by the handlers, which can be deduced from the absence of hygienic-sanitary control of the production processes of raw salads.

Thus, it is necessary for restaurant workers to have training more frequently, to understand the importance of hand hygiene, to practice what is established to Good Handling Practices when preparing food, because it contains the real description of technical procedures. Following all of these procedures prevents foodborne illness (DTAs).

It is expected that the PRPGI will provide public notices so that the research group Society: environment and health can continue this research, due to the importance of ingesting food within the microbiological patterns of food consumption.

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