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Assessment of hygienic quality of surfaces and food handlers in Portuguese school canteens

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INTRODUCTION:

The incidence of food borne outbreaks in school canteens represents a major problem for society, since they serve a youthful population who are particularly susceptible to health risks. According to the World Health Organization (2003), 31% of the reported outbreaks between 1999 and 2000 in Portugal, were originated in schools and kindergartens, which demonstrate the importance of such establishments in the transmission of food borne diseases. Food handlers have a major role in the prevention of these diseases, mainly during the production and distribution of food since they may cross-contaminate raw and processed foodstuffs.

OBJECTIVES:

The aim of this study was to evaluate the hygienic quality of surfaces and food handlers from high school canteens and also to assess the knowledge of these operators, regarding to hygiene and food safety.

MATERIALS AND METHODS:

This study was conducted in three school canteens located in Maia, Portugal. To assess the hygiene and food safety knowledge of food handlers, it was designed a short questionnaire with open and closed questions, about cross-contamination, cleaning and temperature control. These questionnaire was applied as face-to-face interviews. In addition, samples were taken from surfaces in contact with foods (including work surfaces and cutting equipments) and hands of food handlers, after normal cleaning procedures. Depending the sampling sites, samples were collected using two traditional microbiological methods (swabbing and contact plates) and an indirect method of ATP bioluminescence (using the ATP analyzer Hy-lite). The microbiological parameters investigated and relative identification techniques are described in Table 1.

Table 1 – Microbiological parameters and identification techniques studied

| Microbiological parameters | Culture Medium | Incubation conditions | Growth and types of colonies |
|------------------------------|---|-----------------------|--|
| Total Viable Count (TVC) | Nutrient Agar (Liofilchem) | 25 ± 2°C for 24h | Enumeration of cell forming units |
| Enterobactereaceae | Violet Red Bile Glucose Agar (Liofilchem) | 37 ± 2°C for 48h | Enumeration of cell forming units (typical colonies) |
| <i>Staphylococcus aureus</i> | Baird Parcker Agar Base (Liofilchem) | 37 ± 2°C for 48h | Enumeration of cell forming units (typical colonies) |

RESULTS AND DISCUSSION:

A total of 7 food handlers were interviewed. The majority of the participants (85.7%) answered incorrectly at least one of the questions, particularly with regard to temperature control. In general, food handlers are not aware of the importance of temperature control requirements for the control of microbial hazards, assuming that this parameter is only important for organoleptic reasons. The participant who had more incorrect answers, had a lower educational level compared to the others. According to Milan et al. (2004) a higher level of education is responsible for a higher level of hygiene and food safety knowledge. Only one participant demonstrated a high level of knowledge, answering correctly to all the questions. Although cross-contamination seems to be a known issue for food handlers, is not always perceived by them. As regards the hygiene level of surfaces and food handlers (n=33) the results indicates that, in general, was adequately high (Table 2). Only 33.3% of cutting equipments did not conform with the advisory standards for

the TVC($\geq 1.3 \text{ Log}_{10}\text{cfu/cm}^2$) and *Enterobacteriaceae* ($\geq 1 \text{ Log}_{10}\text{cfu/cm}^2$), mainly in knives and in a vegetable cutting blade. Worktops and Teflon chopping boards were in general in compliant with the microbiological advisory standards. Regarding hands hygiene, *S.aureus* were found in 62.5% of food handlers. However, only 12.5 % had an unsatisfactory result ($\geq 1 \text{ Log}_{10}\text{cfu/cm}^2$). Although people that carry out *S.aureus* in their hands are allowed to work in food production, it is crucial that they recognise the importance of careful washing and disinfection. An unsatisfactory contamination with TVC and *Enterobacteriaceae* were also observed in 25% and 12.5% of food handlers, respectively. These results show that the washing procedures applied by some food operators are not being effective.

Table 2 - Conformity of surfaces in contact with food and washed hands to microbiological advisory standards ^a

| Surfaces | TVC at 32°C | | <i>Enterobacteriaceae</i> | | <i>S.aureus</i> | |
|---|---|---|---|---|---|---|
| | Satisfactory (<1.3 $\text{Log}_{10}\text{cfu/cm}^2$) [%] | Unsatisfactory (≥ 1.3 $\text{Log}_{10}\text{cfu/cm}^2$) [%] | Satisfactory (<1 $\text{Log}_{10}\text{cfu/cm}^2$) [%] | Unsatisfactory (≥ 1 $\text{Log}_{10}\text{cfu/cm}^2$) [%] | Satisfactory (<1 $\text{Log}_{10}\text{cfu/cm}^2$) [%] | Unsatisfactory (≥ 1 $\text{Log}_{10}\text{cfu/cm}^2$) [%] |
| Work surfaces (worktops, Teflon chopping boards) n= 19 | 100 | 0 | 100 | 0 | 100 | 0 |
| Cutting equipments (Knives, vegetable cutting blade) n= 6 | 66.6 | 33.3 | 66.6 | 33.3 | 100 | 0 |
| Food handlers' hands n=8 | 75.0 | 25.0 | 87.5 | 12.5 | 87.5 | 12.5 |
| All surfaces n = 33 | 87.9 | 12.1 | 90.9 | 9.1 | 97.0 | 3.0 |

^aHenroid et al., 2004; Sneed et al., 2004

As regards the detection of ATP, it was only performed in 7 work surfaces (2 worktops and 7 Teflon chopping boards). The results ranged between 19 and 440 RLU's/100cm² being in conformity with the guidelines proposed by Grbalová et al. (2003), which indicates the cleanliness of these surfaces. This method proves to be more advantageous over traditional methods since takes into account the presence of foreign matter which may represent a nourishment source for microorganisms.

CONCLUSION:

Out of the total number of samples taken for testing, 24% were not in conformity with the advisory standards. Excessive amounts of TVC and *Enterobacteriaceae* were mainly recorded in cutting equipments. Although the hygiene levels of surfaces and food handlers reveals to be overall satisfactory, showing that the current cleaning procedures applied are effective, there are still some limitations regarding the hygiene and food safety knowledge of food handlers. Temperature control is particularly an improvement area. This study provides more information about the reality of Portuguese school canteens as regards the hygiene and food safety.

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