

# Effectiveness of Good Manufacturing Practice Training for Food Manipulators

Tássia Cris Cruz Campos<sup>1\*</sup> and Mércia Ferreira Barreto<sup>2</sup>

<sup>1</sup>Graduanda em Nutrição, Faculdade Ruy Barbosa, Brazil

<sup>2</sup>Mestra em alimentos nutrição e Saúde UFBA, Professora Faculdade Ruy Barbosa, Brazil

## Abstract

**Introduction:** Good hygienic practices in food preparation should be rigorously applied in food and nutrition units (UANs), which are essential to ensure safe food, and when not properly performed, can make food into agent vehicles of foodborne diseases (DTAs). Foodborne illnesses known to be DTAs are one of the major public health problems. In this way the inability of individuals to handle food has been indicated as one of the main causes of outbreaks of food-borne diseases that are directly related to food contamination. The causes range from the lack of information on personal hygiene, ambient hygiene, improper practices in the operation of the system of production of meals, conservation or distribution in improper conditions.

**Materials and methods:** This is a cross-sectional descriptive study. Held in the period between March and May 2018, in an institution of higher education. (IES), in coffee shops and restaurants located in, Salvador - BA. The study consisted of three stages. The first step was the application of a questionnaire with questions and answers to evaluate the previous knowledge about good manufacturing practices and raise questions for training, the second stage consisted of a previous evaluation and then the training, and the third was constituted in the questionnaire to compare the effectiveness of the training.

**Conclusion:** The results showed that among the subjects that presented the best standard of responses after the training were considered personal hygiene, ambient hygiene, equipment and utensils and temperature control, possibly topics of greater knowledge, since in courses and orientations these are the mainly addressed.

**Keywords:** Good manufacturing practices; Collective feeding; Food handling; Food contamination

## Introduction

Meals outside the home are increasingly present in the lives of individuals, from which it is no longer just a leisure option and has become a matter of necessity. The ease of its consumption related to the lack of time in the preparation of foods is also a factor that triggers the increase in meals outside the home, as well as visits to restaurants by kilo, fast food and other places of food outside the home [1].

Therefore, the good hygienic practices adopted in the preparation of food must be strictly applied in the Food and Nutrition Units (UAN), being fundamental to guarantee a safe food, and when they are not executed properly can make the food in vehicles of agents of foodborne diseases (DTAs). Foodborne diseases known as DTAs are one of the major public health problems [2].

In this way the individuals inability to handle food has been indicated as one of the main causes of outbreaks of food-borne diseases that are directly related to food contamination. The causes range from the lack of information on personal hygiene, ambient hygiene, improper practices in the operation of the meals production system, conservation or distribution in improper conditions [3,4].

According to the Center for Disease Control and Prevention – CDC [5], DTAs affect thousands of people around the world. In Brazil from 2000 to 2017, there were 12,619 outbreaks of DTAs, affecting 183 deaths, in which the Northeast region represents 15.8% of these outbreaks. Out of this total of outbreaks, 45.6% of cases were associated with food consumption outside the home (restaurants, bakeries, schools, events), and many cases are not reported. Raising the awareness of the population about the risks and the correct orientation of food handlers can help reduce the number of people infected by a microorganism by seeking a safe food perspective [6,7].

According to Garcia [8], the importance of training is to give the manipulators theoretical-practical knowledge that is essential to enable and to develop them skills and activities of the specific work in the area of food. Training programs for food handlers are the most advisable and effective means of imparting knowledge and promoting change [9]. Good hygiene practices and the continued education of food handlers contribute to the reduction of the incidence of DTA [10].

Thus, knowledge of the main points of contamination during food processing is essential to ensure microbiological quality and safety for the consumer. Pesticides are an important factor to be considered during processing, these used to control pests and vectors are inserted in abundance in the agricultural production, for better profitability of production [11,12].

Hence, pesticides are potentially toxic to living organisms. Exposure to these products can be through multiple routes, through contamination of the air, dermal penetration or contaminated food and drinking water. Despite this, a certain group of pesticides, organochlorines (OCPs), for obtaining lasting effect, low cost and

**\*Corresponding author:** Tássia Cris Cruz Campos, Graduanda em Nutrição, Faculdade Ruy Barbosa, Brazil, Tel: (071)99402-5931/ (071)3235-4809; E-mail: [tas.cris@hotmail.com](mailto:tas.cris@hotmail.com)

**Received** September 27, 2018; **Accepted** November 08, 2018; **Published** November 19, 2018

**Citation:** Campos TCC, Barreto MF (2018) Effectiveness of Good Manufacturing Practice Training for Food Manipulators. J Nutr Food Sci 8: 740. doi: [10.4172/2155-9600.1000740](https://doi.org/10.4172/2155-9600.1000740)

**Copyright:** © 2018 Campos TCC, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

toxicity against various pests, it has been applied widely in some countries for several decades. Becoming a worldwide problem for human health [13,14].

Whereas a Food and Nutrition Unit (UAN) which handles food must ensure an adequate sanitary hygiene condition of the materials, structures and products without posing a risk to consumer health. Training for food handlers plays a key role in maintaining Good Manufacturing Practices (GMP) in order to ensure better food safety control. In this study, it is questioned whether the effectiveness of the training with manipulators allows a greater knowledge of them on GMP. In view of the above, this research aims to evaluate the effectiveness of the training of manipulators in good manufacturing practices.

## Materials and Methods

This is a descriptive cross-sectional study. Accomplished in the period of March to May of 2018, in a higher education institution, in snack bars and restaurants located in Salvador-BA.

The work was approved by the Ethics Committee of the School of Nutrition of the Federal University of Bahia - UFBA, under the protocol number 68552117.5.0000.5023. To carry out the research, the consent of the snack bars and restaurants was sought, which all the participants signed a Consent Form Free and Informed (TCLE).

Fifteen restaurant and snack bars handlers of both sexes, with ages ranging from 18 to 45, were invited, but only 13 handlers participated in the study. Criteria for inclusion of volunteers in the study were age older than 18 and be food handler in campus establishments. Handlers who were not literate at the time of data collection were excluded.

The snack bars and restaurants had no nutritionist supervision for unit management and no general service aides indicating that all handlers had the role of maintaining the ambient in hygienic-sanitary conditions suitable for the food supply, in the most of the snack bars some of those foods inwere produced elsewhere and later taken to the units installed inside the institution for the subsequent distribution.

The study consisted of three stages. The first step was the application of a questionnaire with questions and answers to evaluate the previous knowledge about good manufacturing practices and raise questions for training, the second stage consisted of an evaluation prior to training and the third of a test to compare the effectiveness of training.

For the training was used a educational material created in the program Microsoft Office Power Point, being displayed in multimedia and as a support instrument. The total workload was 6 hours, separated in 2 days (4 hours on the first day and 2 hours on the second day).

For the first step, a questionnaire adapted from Araújo et al. [15] was distributed, that was used as a probing test to evaluate previous knowledge. It was composed of 4 blocks with 5 questions each, in which the identification of the handler with socio-demographic questions such as: age, sex, schooling, time of service and later basic questions about the knowledge of Good Manufacturing Practices was approached. The contents were grouped into four blocks. Each block was organized by theme, such as: personal hygiene and foods hygiene; hygiene of the ambient, utensils and equipment; receiving, storing and preserving food; health-disease process (Annex I).

In order to classify the knowledge of the food handlers, the percentage of correct answers was calculated based on their compliance with the legislation, according to parameters proposed by Mello et al. and Jorge et al. [16,17], adequate knowledge - 76 to 100% correct; regular knowledge - 51 to 75% correct; and poor knowledge - 0 to 50%

of hits, each block being considered with a score equal to or less than 100%. Then the data will be presented in tables demonstrating the aspects studied.

For the second stage, the questionnaire elaborated by the author Devides et al. [18] was used and afterwards the application of the training (Annex II). Initially the questionnaire was applied before the training in which it was composed of 10 questions. The answers included in this questionnaire were classified as correct or incorrect, as well as the 'do not know answer' option, inserted as an alternative in each question, in order to avoid chance hits by the participants.

For the third step the same questionnaire was applied by the author Devides et al. [18] after the course, it was applied to food handlers in order to evaluate the effectiveness of training on Good Manufacturing Practices.

## Results and Discussion

### Sociodemographic profile

According to the Table 1, in the evaluation of the sex variable, it was observed that 46.1% (n=6) of the manipulators are female and 53.8% (n=7) male. The mean age ranged from 18 to 39 years, with 53.83% (n=7). It was observed that 38.46% (n=5) of the manipulators are older than 40 years. The predominance of males in the activity and the presence of people over 30 years old may prove to be an alternative activity for people who can not get a job placement, establishing their main source of income [19].

Young individuals or people over 40 years old in this area of activity are common, since in the work performed by these manipulators a specific professional qualification is not required. However, there is a need for continuous and ongoing professional training to fill the lack of knowledge on specific topics for food handlers. It is often observed that the first professional experience or the only opportunity to work in the market is due to the functions performed as general service auxiliaries [18].

Regarding the level of schooling, 100% (n=13) had completed high school (Table 1). Researchers state that although a good level of schooling favors the understanding of safe practices, this does not

Variables	N	%
<b>Sex</b>		
Female	6	46,1
Male	7	53,8
<b>Age (years)</b>		
18 – 22	3	23,07
23 – 30	2	15,38
31 – 40	2	15,38
> 40	5	38,46
<b>Scholarity</b>		
Fundamental (incomplete and complete)	0	0
High School (incomplete and complete)	13	100
Superior (incomplete and complete)	0	0
<b>Working time at the establishment</b>		
< 6 months	4	30,72
> 6 months and < 1 year	2	15,38
> 1 year and ≤ 2 years	3	23,07
> 2 years and ≤ 5 years	3	23,07

Source: Research data.

**Table 1:** profile of food handlers of the analyzed establishments, by sex, age group, schooling and length of service. Salvador BA. 2018.

determine the adoption of good practices, that is, other motivational elements such as remuneration are responsible for their satisfaction with work [20].

It is known that in some units the food handlers are hired as auxiliary services, and a specific qualification is not required. Another aspect that may contribute to the devaluation of these workers in UAN is the low salary received to perform the tasks. All of these aspects can contribute to reduce the worker's interest in the area and lead to high turnover of persons occupying these functions [21].

According to Melo et al. [16], the high turnover of the sector's workforce in search of income increase, and the low level of schooling of food handlers are constant factors that make it difficult for these employees to be trained in the implementation of the current legislation and the food supply safely and with quality.

In Table 1, working time at the facility shows that 30.72% (n=4) worked in the establishment for less than six months, (15.38%, n=2) work between 6 months and 1 year, and 23, 07% (n=3) between 2 and 5 years. The short service life of the handlers surveyed can be explained by the turnover in the establishments in the place, some have only 1 month of installed and a maximum of 4 years.

### Themes for the preparation of training

In the collection of the information to elaborate the training the following subjects were identified: Food-borne diseases, personal hygiene and foods hygiene, hygiene of the ambient, utensils and equipment, receiving, storing and preserving food, in a later day was executed considering the programming, with audiovisual resources in order to contemplate all the subjects described above.

RDC 216 establishes food handlers should attend training courses that address at least the following topics: food contaminants, foodborne diseases, hygienic food handling and good practices [9].

According to Lopes and Mourão [22] the training is given by a set of coordinates, which has as reference the structured model of understanding of the organizational phenomenon, with three correlative components: The observation of the need for training, planning and execution of training and evaluation. Getting the manipulator as the main tool for mains use. In this study, the three stages were identified, the results of which are below presented.

In accordance with the survey questionnaire, the results of the aspects studied in each block showed that the level of knowledge of the manipulators attributed to basic knowledge about food-borne diseases, personal hygiene and foods hygiene, hygiene of the ambient, utensils and equipment, and block 4 basic knowledge of food and the health-disease process, 100% (n=13) had adequate knowledge between 76 and 100% of correct answers. About receiving, storing and preserving food, 76.9% (n=10) also reached adequate knowledge between 76 and 100% of correct answers. However, 15.38% (n=2) reached a regular knowledge, between 51 and 75% of correct answers and 7.69% (n=1) deficient knowledge between 0 and 50% of correct answers. Those who did not obtain adequate knowledge gave up not being part of the 2nd and 3rd stage, in which the participation was reduced to 8 manipulators.

### Effectiveness of training

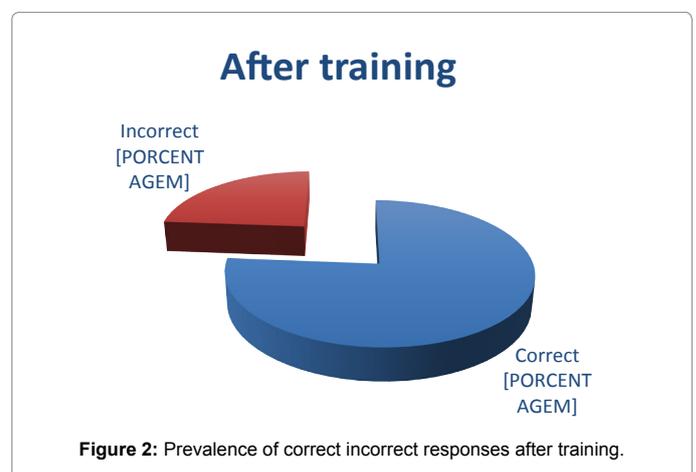
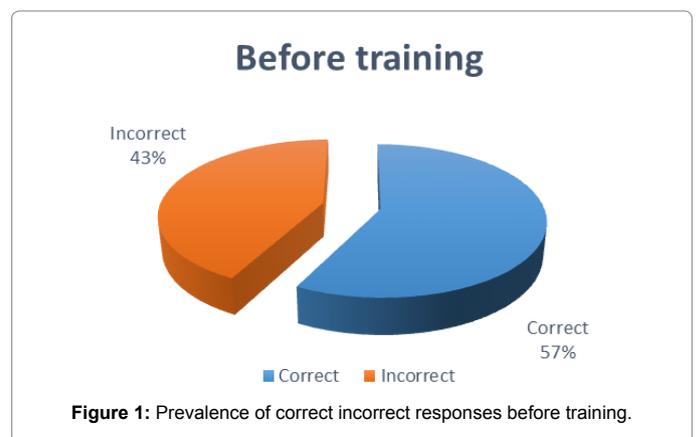
The questions addressed to evaluate the food handlers knowledge about Good Manufacturing Practices were applied before and after the training, in which the results are represented in Figures 1 and 2. Prevalence of correct and incorrect.

To meet the objective of evaluating the effectiveness of the training, the questionnaire was applied before and after the training. The research showed that before the training the participants' level of knowledge was 57%, and the evaluation after the training indicated that the qualification becomes important, changing the success rate to 76%. Figure 1 shows a difference of 19% of hits between before and after the training shown in Figure 2.

From the total of ten questions applied in the comparison of the questionnaires, it was verified that in four questions (1, 6, 8, 9) the answers were better after the training; five questions (3, 4, 5, 7, 10), the responses presented similarity before and after training and only one of the questions occurred worse for responses after training. These are represented in Table 2.

The question regarding temperature control presented a lower percentage of correct answers before training with 37.5%, and after training 100%. The study by Devides et al. [18] reached a very similar result, presented a lower percentage of correct answers before the training with 11%, where this percentage of correct answers rose to 90%. The World Health Organization says that the high temperature contributes to the guarantee of food safety and can eliminate almost all pathogenic microorganisms.

According to Rosa [23], through the use of adequate temperatures in food, it can be ensured that microorganisms present in foods are reduced or eliminated in any of the stages of the cooking process, not allowing conditions favorable to the growth and multiplication of bacteria, reaching the consumer safely.



Questões	Antes do Treinamento	Após o Treinamento
	n(%)	
1. What is the temperature range considered a risk zone, that is, one that favors the growth of most microorganisms?	3/37,5	8/100
2. How could you prevent a Foodborne disease to occur in very handled foods, such as a "salpicão de frango"?	5/62,5	3/37,5
3. Foodborne diseases occur due to?	7/87,5	7/87,5
4. What can happen to foods in general if they are not cooked well?	6/75	6/75
5. Check the most complete alternative about possible sources of food contamination.	7/87,5	7/87,5
6. What is the proper way to dry your hands?	1/12,5	6/75
7. Which of the alternatives is an example of cross-contamination, which may occur during food handling?	6/75	6/75
8. What is the correct way to prepare the chlorinated solution for utensils, equipment and ambients?	5/62,5	8/100
9. If chlorine does end up at your place of work, what is the other way to sanitize equipment and utensils?	3/37,5	7/87,5
10. After washing the equipment and utensils with soap and water, what should be done to kill the microorganisms even more?	3/37,5	3/37,5

Source: Research data.

**Table 2:** Prevalence of correct responses in the evaluation before and after applied to food handlers. Salvador BA. 2018.

Regarding foodborne diseases in the second question the result was not positive 62.5% did not know to identify the correct alternative after the training, this result was similar to that found by Abadia [24], which found in the schools of education fundamental in Rio Branco-AC that 53.0% were not able to recognize the groups of risks. Although addressed in training, the DVA theme is a technical theme and requires further study in future training.

For the third and fourth question, the same theme 'food-borne diseases' was evaluated in the same way between 87.5% and 75%, both before and after training. The same happened with the theme 'cross-contamination' being mentioned in the fifth and seventh questions between 87.5% and 75% respectively for hits, both before and after training. What could have interfered in this result being stable, was the lack of dynamics or games related to the theme, since they were represented with slide show.

For the item personal hygiene obtained a lower percentage of correct answers before training with 12.5%, exceeding this percentage after training to 75%. This topic is extremely important for a good food handling, therefore, a study in the north of Ceará, hygienic-sanitary conditions of the palm and nails of 7 handler food in 4 state schools were investigated and the authors found strict aerobic microorganisms and faculties, above the established (>100UFC) [25].

For this reason, numerous studies have demonstrated the inefficiency of adequate procedures for hand washing or even non-execution it, highlighting the need for constant awareness about the importance and supervision during food handling processes.

For the content about hygiene of the ambient the question 'what is the correct way to prepare the chlorinated solution for utensils, equipment and ambients', showed 62.5% of assertions before and reached a higher score after training with 100%, the penultimate question was a significant result of assertions reaching a score of 87.5% after training.

For the last question, there were no relevant results presenting 62.5% before and after the training, unable to identify the correct alternative of how to kill all microorganisms after the washing of soap and water of the utensils. What was reported by Abdaia [24] was similar, where the study in one of the questions assesses whether 'dishwashing with detergent leaves them free of contamination' 48.4% did not know or checked the wrong option.

Evaluating the importance about adequate hygiene of the ambient, a study by Poerner et al. [26] detected total coliforms in 100% of the

food handling surfaces in Santa Rosa-RS food services, alerting to the insufficient hygiene and to the risk of cross-contamination, in which the appropriate cleaning is able to reduce the microorganisms in the surfaces. Therefore, the sanitization process is indispensable, making the efficacy of the cleaning and sanitizing compounds, used in the surfaces, the success determinants of the hygiene process [27].

It is known that one of the challenges for the food handlers training is to keep the handlers involved with the presented contents. For this, it is necessary to choose active methodologies thought in the planning of the training and thus to meet the expectations regarding the same. In this study, it was considered practical activities of samples of objects used by the participants for microbiological evaluation, demonstration of forms of contamination in the UAN, as well as a practical explanation about hand hygiene, being applied the clear and objective demonstration of correct practices, as well as the causes and consequences of improper handling. It is important to emphasize that in teaching skills and providing active learning, the perception of risk of contamination is increased, always considering the working ambient [28].

It is important to note that after the training, a subjective evaluation was performed with the manipulators. In the questioning about the positive aspects of the training was highlighted by the handlers: the location of the training. According to the handlers the realization of training in a different place of the unit allows to absorb the training. However, for Da Cunha et al. [29], the workplace should be considered for the training of manipulators to improve their understanding of processes, to reinforce theoretical ideas in practice and to enhance the training method. On the other hand, the absence of reference material and the follow-up of training by the establishment owners were also considered by the handlers to be negative.

The number of subjects covered in a short period of time was considered as limitations to the training, since the training was concentrated with a six-hour workload. It was also identified that despite the use of dynamics, videos, slides with images and few texts, it is still necessary to apply more active methodologies and a greater workload for the issues addressed in the legislation. In this way clarified by Medeiros [30], the most used methodologies are the interactive media, mainly audio-visual media and videos, but lectures with dynamics and recreations have also demonstrated good results.

## Conclusion

Taking into account the presented aspects, regarding the evaluation

of the effectiveness of the training it is verified that this was considered positive, since in only one of the answers there was a greater number of errors when compared before and after the training, being its theme foodborne diseases.

Among the topics that the training presented the best standard of answers were personal hygiene, environmental hygiene, equipment and utensils and temperature control, possibly topics of greater knowledge, because in courses and orientations these are the ones mainly addressed.

It should be pointed out that a suggested intervention is the extension activities with undergraduate students in internship, applying technical knowledge in good manufacturing practices, leading to the improvement of some non-conforming points identified in the study and making it possible for students to achieve their professional and career.

It is recommended that the insertion of training programs on good handling practices be permanent and continuous in all food and nutrition units, assuring to the consumers the hygienic-sanitary safety of the food produced and greater knowledge of the handlers in service.

## References

1. Magnoni D, Tardioli M, Zagato M, Miyagi M, Takayama P, et al. (2016) Segurança alimentar e informação nutricional podem reduzir a intoxicação alimentar na alimentação fora do lar. *Rev Bras Nutr Clin* 31: 91-96.
2. Chouman K, Ponsano EHG, Michelin AF (2010) Qualidade microbiológica de alimentos servidos em restaurantes self-service. *Rev Inst Adolfo Lutz*. São Paulo 69: 261-266.
3. Góes JAW, Furtunato DMN, Veloso IS, Santos JM (2001) Capacitação dos manipuladores de alimentos e a qualidade da alimentação servida. *Revista Higiene Alimentar* 15: 20-22.
4. Oliveira ABA, Paula CMD, Capalonga R, Cardoso MRI, Tondo EC (2010) Doenças transmitidas por alimentos, principais agentes etiológicos e aspectos gerais: uma revisão. *Rev HCPA* 30: 279-285.
5. <https://www.cdc.gov/fdoss/annual-reports/index.html>
6. <http://portalms.saude.gov.br/saude-de-a-z/doencas-transmitidas-por-alimentos/situacao-epidemiologica>
7. Deon BC (2012) Diagnostico de boas práticas de fabricação em domicilio da cidade de Santa Maria-RS 2012. Dissertação (Mestrado em Ciência e Tecnologia dos Alimentos) Universidade Federal de Santa Maria-RS.
8. Garcia PPCO (2013) Modelo Transteórico aplicado aos manipuladores de alimentos e as condições higiênico sanitárias de Restaurantes Institucionais, Brasil. Universidade de Brasília.
9. <http://www.anvisa.gov.br>
10. Marmetini PR, Ronqui L, Alvarenga OVA (2010) Importância das boas praticas de manipulação para os estabelecimentos que manipulam alimentos. *Revista Científica Facimed*, pp: 263-273.
11. Li Z, Jennings A (2017) Worldwide regulations of standard values of pesticides for human health risk control: a review. *Int J Environ Res Public Health* 14: 826.
12. Amal A, Raslan AA, Elbadry S (2018) Estimation and human health risk assessment of organochlorine pesticides in raw milk marketed in Zagazig city, Egypt. *J Toxicol* 2018: 3821797.
13. Pirsaeheb M, Limoe M, Namdari F, Khamutian R (2015) Organochlorine pesticides residue in breast milk: a systematic review. *Med J Islam Repub Iran* 29: 228.
14. Thompson LA, Darwish SW, Ikenaka Y, Mm Nakayama S, Mizukawa H, et al. (2017) Organochlorine pesticide contamination of foods in Africa: incidence and public health significance. *J Vet Med Sci* 79: 751-764.
15. Araújo WDB, Almeida MEF, Santos CEM, Pizziolo VR (2010) Avaliação do conhecimento de manipuladores de alimentos quanto às boas práticas de fabricação. *Vivências* 6: 67-73.
16. Mello GA, Gama MP, Marin VA, Colares LGT (2010) Conhecimentos dos manipuladores de alimentos sobre boas práticas nos restaurantes públicos populares do Estado do Rio de Janeiro. *Braz J Food Tech Campinas* 13: 60-66.
17. Jorge MN, Costa NC, De Souza TRA, Leite RFM (2013) Fatores relacionados aos conhecimentos de manipuladores de alimentos sobre boas práticas de manipulação em estabelecimentos comerciais. *Nutrir Gerais, Ipatinga* 7: 1015-1029.
18. Devides GGG, Mafei DF, Catanozi MLP (2010) Socioeconomic and professional profile of food handlers and the positive impact of a training course on good manufacturing practices. *Braz J Food Technol* 17: 2.
19. Praxedes PCG (2003) Aspectos da qualidade higiênico-sanitária de alimentos consumidos e comercializados na cidade de São Remo. 120 f. Dissertação (Mestrado) - Universidade de São Paulo, São Paulo (SP).
20. Ferreira JS, Cerqueira ES, Carvalho JS, Oliveira LC, Costa WLR, et al. (2013) Conhecimento, atitudes e práticas em segurança alimentar de manipuladores de alimentos em hospitais públicos de Salvador, Bahia. *Revista Baiana de Saúde Pública* 37: 35-55.
21. Munhoz PM, Pinto JPAN, Biondi GF (2008) Avaliação microbiológica para incrementar a qualidade higiênico-sanitária de um programa de alimentação da rede municipal de ensino. *Higiene Alimentar, São Paulo* 22: 72-75.
22. Lopes JM, Mourao L (2010) Crenças acerca do sistema de treinamento: a predição de variáveis pessoais e funcionais. *Estud psicol (Campinas)* 27: 197-206.
23. Rosa MS, Negreiros SRF, Sebra LMAJ, Stamford TLM (2008) Monitoramento de tempo e temperatura de distribuição de preparações à base de carne em escolas municipais de Natal (RN), Brasil. *Rev Nutr* 21: 21-28.
24. Abadia LL, Maffi BA, Lima SG, Mederios IMS, Ramalho AA, et al. (2017) Conhecimento de merendeiros sobre segurança dos alimentos em pré-escolas atendidas pelo PNAE no município de Rio Branco - AC. *Higiene Alimentar* 31: 264-265.
25. Mendes ML, Oliveira GN, Souza GC (2002) Avaliação das mãos de manipuladores de merenda escolar em escolas estaduais do município de Limoeiro do Norte-CE. In: XVIII congresso brasileiro de ciências e tecnologia de alimentos. Porto Alegre-RS, p: 3652.
26. Poerner N, Rodrigues E, Palhano AL, Fiorentini AM (2009) Avaliação das condições higiênico-sanitárias em serviços de alimentação. *Revista Instituto Adolfo Lutz, São Paulo* 68: 399-405.
27. Massaut KB, Decol LT, Moura TM, Ortiz ÂS, Aleixo JA (2008) Validação de procedimentos de higienização de uma unidade de alimentação e nutrição da cidade de Pelotas/RS. XVII Congresso de Iniciação Científica, X Encontro de Pós Graduação. Faculdade de Nutrição – UFPEL.
28. Nieto-montenegro S, Brown JL, Laborde LF (2008) Development and assessment of pilot food safety education materials and training strategies of Hispanic workers in the mushroom industry using the health action model. *Food Control* 19: 616-633.
29. Da cunha DT, Fiorotti RM, Baldasso JG, De souze M, Fontanezi NM, et al. (2013) Improvement of food safety in school meal service during a long-term intervention period: a strategy based on the knowledge, attitude and practiceriad. *Food Control* 34: 662-667.
30. Medeiros CO, Cavalli SB, Salay E, Proença RPC (2011) Assessment of the methodological strategies adopted by food safety training programmes for foodservice workers: a systematic review. *Food Control* 22: 1136-1144.