Evaluation of the effects of food safety training on the microbiological load present in equipments, surfaces, utensils and food handlers in restaurants

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Introduction

Restaurants play a pivotal role in offering delectable meals and creating a pleasant ambiance for customers. However, ensuring the microbiological safety of food is a critical responsibility of the restaurant staff. In this context, food safety training plays a pivotal role in upholding quality standards and mitigating microbiological risks.

The main objective of the current work was the identification and quantification of spoilage and pathogenic microorganisms present on the equipment's, surfaces, utensils and in the hands of the food manipulators and evaluate the evolution of the number of microorganisms found before and after food safety training. Also, we searched for the presence of *Listeria monocytogenes* in the drains of the restaurants analyzed before and after food safety training.

Fig. 1- Food and equipment´s contaminated with pathogenic bacteria

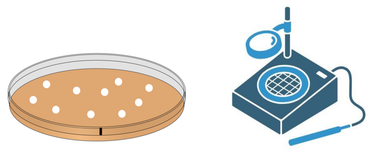


Fig. 2- Quantification of microorganisms

Fig. 3- Employee training

Methods

For the present work were carried out four moments of analyses at four restaurants, two moments analyses were done before food safety training and the other two were done after food safety training. In each visit, thirty-two swabs were performed from the equipment's, surfaces, and utensils all together and eight swabs were performed of four manipulators (right and left hand). Also, we evaluated the presence of *Listeria monocytogenes* (counting and research) in drains using absorbent sponges. In accordance with ISO standards.

Microorganism	Medium	T °C/h
Mesophilic	Plate Count Agar (PCA)	30ºC /72h
Enterobacteriaceae	Violet Red Bile Glucose Agar	37ºC /24h
Escherichia coli	Tryptone Bile X-Glucuronide Agar	44ºC/24h
Staphylococcus aureus	Baird Park Agar	37ºC /48h
Listeria monocytogenes	Chromagar Listeria	37ºC /24h

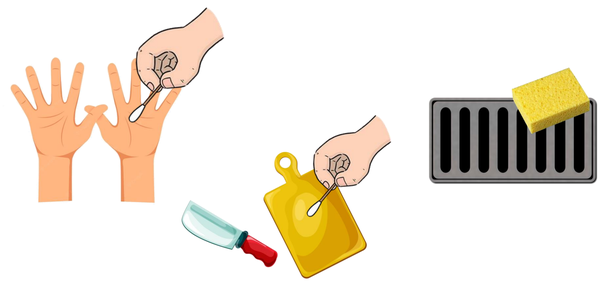
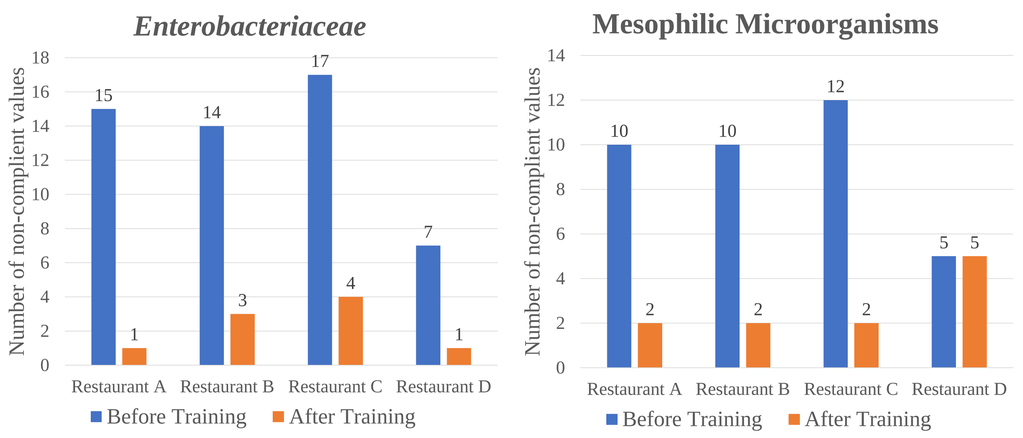


Fig. 4- Performing swabs in various surfaces at study

Results

Non-complient values present in equipments, surfaces and utensils analysis



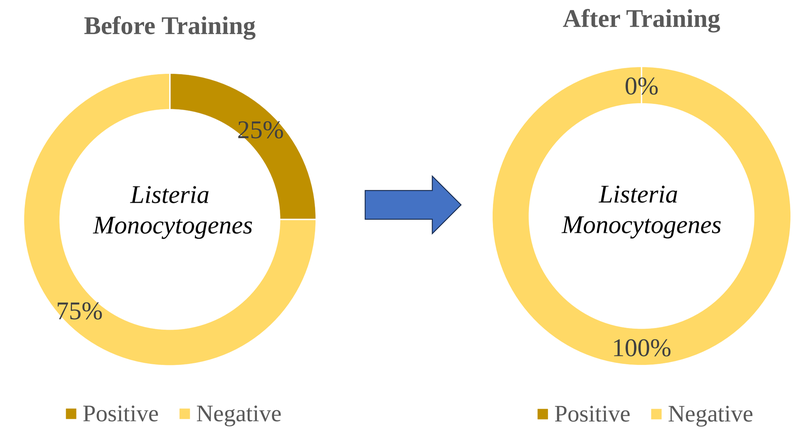
The number of values exceeding food safety limits decreased after training.

Restaurant	A (% Mean Dif)	B (% Mean Dif)	C (% Mean Dif)	D (% Mean Dif)
Enterobacteriaceae	-98,0	-99,9	-99,7	+32,6
Mesophilic Microorganisms	-98,7	-99,5	-96,7	-79,9

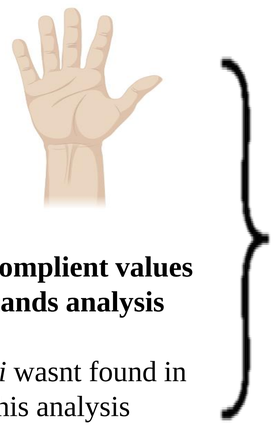
Note: (-) Decrease in the number of microorganisms; (+) Increase in the number of microorganisms

There was a decrease above 90% on microbiological count for restaurants A, B and C. Restaurant D had a decrease of 79,9%.

Presence of *Listeria monocytogenes* in Drain analysis

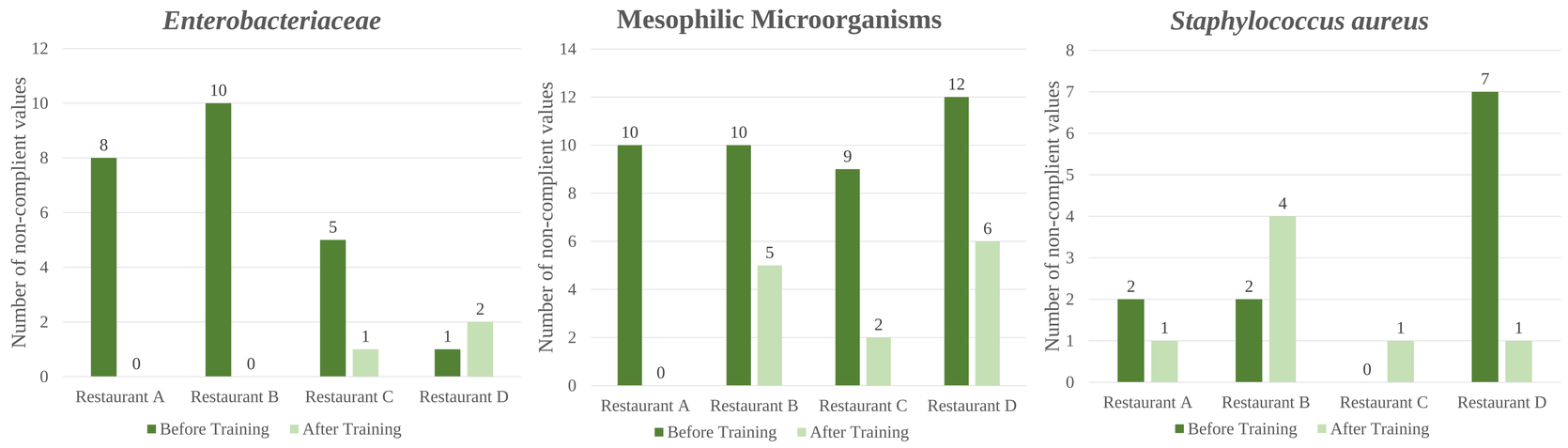


The results were analysed based on the microbial criteria of Pablo and Moragas [1]; Soares *et al*. [2] and Labović *et al.* [3].



Non-complient values in hands analysis

E. *coli* wasnt found in this analysis



Restaurant	A (% Mean Dif)	B (% Mean Dif)	C (% Mean Dif)	D (% Mean Dif)
Enterobacteriaceae	-99,8	-100	-99,8	+125
Mesophilic Microorganisms	-98,8	-35,8	-94,6	-92,2
Staphylococcus aureus	+190,4	+58,8	+100	-80,4

Note: (-) Decrease in the number of microorganisms; (+) Increase in the number of microorganisms

There was a decrease above 90% for the means of *enterobacteriaceae* on restaurants A, B and C. For the mesophilic microorganism we've seen a decrease of 35,8% for restaurante B and above 90% for the rest restaurants. Only restaurante D suffered a reduction in the means of S. *aureus* counts.

The number of values exceeding food safety limits decreased after training for *enterobacteriacea* and *mesophilic microorganisms*. We didnt see such positive evolution for Staphylococcus aureus because of the presence of constant open wounds and asymptomatic carriers of S. *aureus*

Conclusion

Based on the results shown we can conclude that food safety training was very effective. We've seen an abrupt reduction of the means of the number of microorganisms quantified in the equipment's, surfaces, utensils and hands. This abrupt reduction can be explained by the fact that the employees didn't know or did not comply with good hygiene practices during the service before the food safety training.
The presence of *Listeria monocytogenes* in the drains, after training, was absent denoting the importance of correct mechanical and chemical disinfection.

Acknowledgments

This work was supported by National Funds from FCT - Portuguese Foundation for Science and Technology, under the projects UIDB/CVT/00772/202, and LA/P/0059/2020 and UIDB/04033/2020.

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