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Determination of hygienic conditions of home kitchen sponges in Manisa, Turkiye

Bülent Ergönül

Department of Food Engineering, Faculty of Engineering, University of Manisa Celal Bayar, Muradiye, Manisa, Turkiye.

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ABSTRACT

It is known that sponges remove the food residues from the utensils, sinks and equipment used in home kitchens. Porous kitchen sponges provide the perfect physical place for a bacterial community in this study, it was aimed to determine the hygienic conditions of sponges used in home kitchens in Manisa, Turkiye. Samples were collected from 100 different addresses in Manisa city center. Results of the microbiological analysis showed that the average total mesophilic aerobic bacteria count of samples was 6.42 log cfu/sponge, whereas total coliform and total yeast and mold counts of the samples were 1.63 log cfu/sponge and 2.12 log cfu/g respectively. *Staphylococcus aureus*, *Salmonella spp.* and *Escherichia coli* O157:H7 were not detected in any of the samples. The data obtained in this study supports the previous findings of other researchers that kitchen sponges provide a hospitable environment for microorganisms.

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1. Introduction

Sponges are widely used in order to remove food residues from the utensils, sinks and equipment used at home kitchens. Sponges used in kitchens can be an important reason for cross-contaminations (1).

*Corresponding author. Tel.: +905324813355
E-mail address: bulent.ergonul@hotmail.com.

Kitchen sponges offer an ideal place for harmful bacteria and other pathogens, such as viruses, to grow. Some of these pathogens include *Escherichia coli, Salmonella*, *Klebsiella pneumoniae,* and *Enterobacter cloacae* (2). Sponges and dishcloths are known as potential sources for the spread of microorganisms to food contact surfaces (3).

Improper handling after use, with the aid of food residues and moisture, might cause microorganisms to grow and spread. As a result of inadequate food hygiene practices, unclean surfaces have been associated with opportunistic microorganisms such as *Staphylococcus aureus* (4). Microorganisms can survive weeks after contamination with sponges and even though the predominant flora of the sponges seems to be harmless microorganisms some studies reported sponges can also be a reservoir for potentially pathogenic bacteria (5). Moreover, metagenomic sequence data of a recent study showed that viruses, eukaryotes, and archaea were a part of the sponge flora as well as bacteria (3).

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It is estimated that, up to 87% of foodborne disease outbreaks that occurred in the United Kingdom, Europe, Australia, New Zealand, the United States, and Canada originated from food prepared or consumed at home (6). Considering the potential risks of the cross-contamination and spread of microorganisms from kitchen sponges our aim was to determine the hygienic profile of kitchen sponges used domestically at homes in Manisa region. The kitchen sponges were analyzed for total mesophilic aerobic bacteria, *Staphylococcus aureus, Salmonella spp., E. coli* O157:H7, total coliform bacteria, and yeast and molds.

2.Materials and Methods

Sponges were collected randomly from 100 different houses in Manisa City Center. Sponges were taken into sterile stomacher bags and immediately transferred to the Microbiology Laboratory of Manisa Celal Bayar University in order to determine the microbiological profile.

The first dilution was made by soaking the sponges in 250 mL of sterile peptone water. The stomacher was used for 60 s per sponge to transfer the microorganisms into peptone water from the sponge, and then serial dilutions were prepared by using 9 mL of sterile peptone water. Enumeration methods used in the study were given in Table 1. The enumeration results were expressed as log cfu/sponge.

3.Results

Microbiological analysis results of the sponge samples are given in Table 2. All sponges had a countable microbiological load and total mesophilic aerobic bacteria (TMAB) counts were ranging between 2.30 and 8.11 log cfu/sponge. On the other hand, 41 out of 100 sponges contained detectable yeast and mold at an average of 2.12 log cfu/sponge. 56% of the sponges were positive for coliform bacteria with a maximum level of 1.82 log cfu/sponge. *E.coli* O157:H7, *S.aureus* and *Sallmonella* spp. were not detected in any of the sponges.

Table 1. Enumeration methods of microorganisms (13-15)

Microorganism	Medium	Incubation criteria
Staphylococcus aureus	Baird Parker Agar with egg yolk tellurite emulsion supplement	37°C / 24 h
Escherichia coli	CT-SMAC	37°C / 24 h
Salmonella	Lactose Broth Selenite Cystine Broth MacConkey Agar Salmonella-Shigella Agar	
Coliform bacteria	Violet Red Bile Agar	37°C / 24 h
Total mesophylic aerobic bacteria	Plate Count Agar	35°C / 24 h
Yeast and mold	Dichloran Rose Bengal Chloramphenicol Agar	25°C / 3-5 days

Table 2. Microbiological status of sponge samples (log cfu/sponge) (n=100)

Microorganism	Average (min-max)	n_p
Escherichia coli O157:H7	<1	-
Staphylococcus aureus	<1	-
Total coliform bacteria	1.63 (1.27-1.82)	56
Total mesophilic aerobic bacteria	6.42 (2.30-8.11)	100
Yeast and mold	2.12 (1.04-3.24)	41
Salmonella spp.	<1	-

n_p: Number of the positive sample out of 100

4.Discussion

Kitchen sponges are shown to be the most contaminated item in the kitchen and might play a role in contaminating other surfaces and foods (7). *E.coli* O157:H7, *S.aureus* and *Sallmonella* spp. were not detected in the sponges collected for this study. On the other hand, some researchers reported having found these microorganisms in their samples. Hassan and El-Bagoury (7), reported that *Pseudomonas* spp., *Enterobacteriaceae* and *Staphylococcus aureus* dominated the sponge flora. Shayeghi et al., (8), also reported that a considerable number of wire sponges and dishcloths samples contained *S.aureus*, *S.epidermidis* and *E.coli*, as well as other bacteria and fungi.

All samples had countable levels of mesophilic aerobic bacteria, which is not unexpected, mesophilic aerobic bacteria counts of sponges remain above the detectable limit even after some disinfection strategies, despite the fact that meaningful decreases are observed (9). However, bacterial reduction is dependent on the method of disinfection (9,10). A more important fact to consider is the level of TAMB count rather than the number of positive samples. The average level of TMAB counts from the sponges collected for this study indicates that sponges were not properly cleaned after use and the hygienic requirements are not met in these kitchens. On the other hand as another sanitation indicator coliform count of the sponges was found to be lower than in the previous studies conducted by other researchers. According to Obi and Ndukwu (11) total coliform bacteria counts of 60 sponge samples were ranging between 7.79 and 7.83 log cfu/mL.

Apart from the hygiene practices in the kitchen one of the main factors affecting coliform count might be the microbiological quality of the tap water. In cases of detecting considerably high levels of coliform bacteria from kitchen items and utensils poor microbiological quality of the water used in these kitchens might be an important factor.

Mold and yeast were detected from 41% of sponge samples at an average of 2.12 log cfu/sponge, similar to the results obtained from the previous studies (8,12).

5.Conclusion

The data obtained in this study supports the previous findings of other researchers that kitchen sponges provide a hospitable environment for microorganisms. However our data showed that the sponges collected for this study did not contain *E.coli* O157:H7, *S.aureus, Sallmonella* spp. and had relatively lower levels of mold & yeast and coliform counts compared to other studies. This might indicate that the households from which the samples were collected had better understanding and employment of hygienic practices. Disinfection strategies and the effectiveness of antimicrobial sponges might be further investigated in future studies to lower the microbial load of the sponges and other utensils in order to prevent spreading of microorganisms and contaminating foods and food contact surfaces.

Conflict of interest

The author declares that there is no conflict of interest.

Acknowledgment

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