Microbial Load in Kitchen Dish Wash Scrubber

P. Harini[1] and N. P. Muralidharan[1*]

[1]*Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai- 600077, India.*

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

Original Research Article

ABSTRACT

Introduction: Kitchen sponges are most commonly used cleaning equipment. These sponges were heavily contaminated with the microorganisms which acts as a carrier of food borne diseases. It provides favourable conditions for the growth of bacteria and other microorganisms. It acts as a reservoir of pathogens and a vector of cross contamination. Proper sanitization techniques must be followed to avoid cross contamination.

Aim: The aim of the study was to evaluate the microbial load in used kitchen dish wash scrubbers.

Materials and Method: Twenty dish wash scrubbers were collected in a sterile disposable container. Moisture was removed by drying the scrubber. The procedures were conducted after 5 days. Measured the weight of the scrubber weighing 1 gram and soaked it in 500 ml of sterile saline for 30 minutes, agitated it and transferred 10 microliter to the media. And identified the organisms by the growth characters on the media for the possible pathogens.

Result: From the growth characters the organisms identified were *Coliform*, *Bacillus* and *Staphylococcus*.

Conclusion: This study showed that scrubbers were not clean and were at increased risk of food poisoning. Kitchen sponges were highly contaminated with potentially pathogenic bacteria which might be transferred from the overall kitchen environment to food contact surfaces and consequently cause food contamination

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*Corresponding author: E-mail: muralidharan@saveetha.com;

1. INTRODUCTION

Scrubbers and dish wash scrubbers are the most commonly used cleaning equipment in kitchens all over the world. It is most often used to clean surfaces, dishes, pots and pans, refrigerators, countertops, sinks, stovetops and handles. Using the filthy and unwashed sponges to clean surfaces leads to the transfer of microorganisms like bacteria and viruses. Using the sponges covered with harmful bacteria to clean places and things like faucet handles, plates and utensils allow the bacteria to spread easily. Direct contact of human beings to these places leads to many diseases [1,2]. Kitchen wipes address a significant vehicle of microbial transmission and upkeep of waste microscopic organisms and pathogenic strains liable for food borne infections. Kitchen wipes are usually utilized by customers for cleaning up and scouring of skillet and meals, but at the same time are utilized for cleaning kitchen surfaces, like sinks, fridges and burners. Brushes are the predominant utensils for manual cleaning of dishes all over the world. In an observational investigation in the UK, in a few households the same scrubber is used to clean the dishes and the other areas of the kitchen which directly leads to the contamination of food and also a predominant reason for food borne diseases all over the world.

Bacteria multiply rapidly in a used sponge because of the presence of moisture and nutrients which supports the growth of many pathogenic microorganisms. These favourable conditions enhance the growth of bacteria. Successive use of the same dirty sponges leads to the transfer of bacteria from one surface to the other during the cleaning process. Kitchen dish wash scrubber is identified as the ideal place for the growth of harmful and the most pathogenic bacteria and viruses. Pathogens like *E. coli Salmonella, Enterobacter cloacae and Klebsiella pneumoniae* are most commonly identified in the dirty dish wash scrubbers [3]. Chemical ingredients or ordinary dishwashing soaps do not considerably reduce microbial load in kitchen sponges. Furthermore, multi-drug-resistant bacteria were widespread in the home environment, with no significant differences found between biocide users and non-users, as well as pathogen recovery frequency [4]. Our team has extensive knowledge and research experience that has translate into high quality publications [5–9].

Domestic dish wash scrubbers are not a threat to the environment or considered to pose any hazardous warning until it is revealed to be heavily contaminated. Selected opportunistic pathogenic fungi, viruses and bacteria is not only limited to the rubber seals but it spreads to the entire interior and provides an environment-influenced microbiota throughout the kitchen. To minimize the potential risk of spread of bacteria sponges should be decontaminated at regular intervals. Regular heating of the contaminated sponge is advisable or soaking the contaminated sponge in the bleach solution or cleanser can be done for the reduction in the microbial load of bacteria [10]. The aim of the study is to observe the microbial load in the used domestic kitchen dish wash scrubber.

2. MATERIALS AND METHODS

Twenty domestic dish wash scrubbers were collected randomly from different households in a sterile disposable container. Dried the scrubber and removed the moisture from it. The scrubber was isolated for 5 days. The weight of the scrubber was measured and the average value was calculated. The scrubber piece weighing 1 gram was soaked in a sterile saline and agitated for 15 minutes and transferred 10 microlitre of saline to the media. Blood agar was used as a media to culture the fastidious organisms. Total CFU was calculated per ml and identified the organisms by its characteristic growth on the media and by the standard biochemical protocol for possible pathogens. The colonies formed by the organisms were counted and the number of microbes isolated per gram were calculated and the mean value was evaluated.

2.1 Statistical Analysis

All the data obtained were analyzed by Student's-t-test using MS-Excel, represented as mean ± SD. The results were computed statistically. In all tests, the level of statistical significance was set at $p<0.05$.

3. RESULTS AND DISCUSSION

From the growth characters the organisms identified were *Coliform, Bacillus spp and Staphylococcus spp*. In 1g of scrubber the number of microbes isolated varied from 5 to 1658. Total mean value was found to be 629.1. Total number of microbes isolated per gram of

each sample was calculated (Table 1). Samples were inoculated onto blood agar (Fig. 1) and the total colony forming unit was counted.

Table 1. Total CFU obtained from the contaminated kitchen sponges

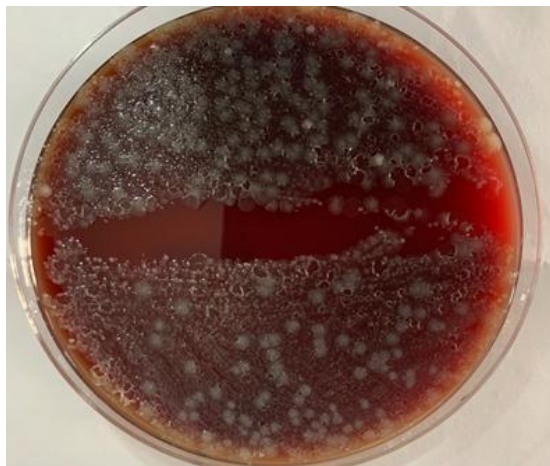| S. No	Total CFU isolated/ gram
1	732
2	512
3	1317
4	961
5	808
6	1044
7	1033
8	10
9	128
10	25
11	941
12	32
13	1496
14	841
15	1658
16	5
17	92
18	7
19	62
20	878

Fig. 1. Growth of microorganisms on Blood agar from the contaminated kitchen dish wash scrubber

In a previous study they have reported that sponges are the most commonly used cleaning equipment in the kitchen area. These sponges may contain large amounts of pathogens which are harmful to our health causing food borne diseases. They also mentioned that most commonly isolated organisms were *Salmonella* and *E. coli* which are the main reason for the cause of food poisoning [11]. In present study it is reported that from the sponges the organisms most commonly isolated were coliform, *Bacilli* and *Staphylococcus.* In a previous study they detected *Listeria monocytogenes* in an used sponge which acts as a food borne pathogen vehicle which adhered to and survives on different surfaces of sponges [12]. In present study it is reported that coliform, *Bacillus* and *Staphylococcus* were the food borne pathogens seen in a contaminated sponge. In several contaminated kitchen sponges *Enterobacter sakazakii* was isolated which deserved particular attention which is the reason for the food poison and sickness occurring in children [13]. In a study performed at National Sanitation Foundation they have isolated coliform bacteria in the kitchen sponges and kitchen dish wash clothes. It is a rod shaped gram negative bacteria. Their study reported that more than 75% of the sponges and dish wash cloths tested to find coliform bacteria on their surfaces. Similarly present study also reported presence of coliform bacteria on the surface of kitchen sponges [14].

A study done with 201 contaminated kitchen sponges revealed that the sponges are heavily contaminated with bacteria. They collected kitchen sponges from different places of work like hotels, restaurants, pastry shops and cafeterias. They reported the presence of coliform bacteria more than one billion CFU/cm^3. The presence of coliform is an indicator of potential and fecal contamination [15]. Not all the coliform bacteria cause illness, highly notorious species of coliform like *E.coli* and *Shigella* cause illness causing food borne diseases. Present study also reported the presence of coliform bacteria. In a previous study done using 16s RRNA sequencing technique they have observed Gammaproteobacteria found in the microbiome of the kitchen sponges analyzed using fluorescence in situ hybridization [16]. In some previous studies *Pseudomonas, Bacillus, Micrococcus, streptococcus* and *Lactobacillus* were dominantly found in the contaminated kitchen sponges. Coliform count was more than 4.0 LOG CFU $(mm^3)^{-1}$ [17]. Likewise present study also isolated bacteria like coliform, *Bacillus* and *Staphylococcus*.

Kitchen sponges were contaminated with the most hazardous pathogens which lead to the cross contamination in food. These sponges provide favourable conditions for the growth of bacteria like providing organic food residues and contains moisture and humidity which supports

its growth. *E.coli*, *Staphylococcus* and *Salmonella* species were most commonly found in the kitchen sponges [18]. Our team has extensive knowledge and research experience that has translated into high quality publications [19–30,31–35].

There are some potential limitations, that is the study is taken into consideration only with small samples and it should be considered to be done on a large scale. And there is a high possibility of occurrence of error. In future decontamination methods should be carried out. In the future it can be formulated for a healthy and hygienic kitchen cleaning practice.

4. CONCLUSION

This study showed that scrubbers were not clean and were at increased risk of transmitting infection and may cause food poisoning. Kitchen sponges were highly contaminated with potentially pathogenic bacteria which might be transferred from the overall kitchen environment to food contact surfaces and consequently cause food contamination. It will also be responsible for the spoilage of food stored in the vessels washed with such scrubber. A proper cleaning and disinfection done after every use may prevent the spoilative activity of the bacteria in the scrubbers.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

SOURCE OF FUNDING

ACKNOWLEDGEMENT

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle4.com/review-history/74411