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Monitoring the hygiene of reusable cutlery as an effort to sustainable lifestyle

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Abstract - Efforts to live healthy and implement sustainable living can be achieved in many ways, one of which is by using reusable cutlery when eating. Contamination of cutlery can cause disease and poisoning. The purpose of this study was to determine the feasibility of cutlery to be used in terms of hygiene, namely, to see the presence of E. coli and Salmonella bacteria found in cutlery in a canteen in industrial areas. The research method used is qualitative and quantitative analysis using the swab technique. The samples used were 6 samples, consisting of 2 spoons, 2 plates, and 2 glasses. From testing the samples of cutlery in the canteen, all of them showed the presence of E. coli and Salmonella bacteria contamination. Therefore, it can be concluded that all samples of cutlery that can be reused in a canteen do not meet the eligibility requirements as cutlery due to contamination by E. coli and Salmonella bacteria which can pose a risk of disease and even poisoning.

Keywords: bacteria, hygiene, reusable cutlery

1 Introduction

Food and drinks consumed daily by humans must be safe, healthy, and nutritious food and drinks. As time goes by, the mobility of life requires eating utensils that are suitable for humans in this modern era. However, disposable tableware is less compatible with the principle of environmental sustainability. Efforts to live healthy and implement sustainable living can be achieved by using reusable cutlery when eating. Thus, it is necessary to pay attention to basic sanitation for rewashed tableware that meets health eligibility criteria to prevent disease.

Pradina states that food hygiene and sanitation are steps taken to control factors in food, people, places, and equipment that might cause health problems. Contamination in eating utensils and food can cause disease. Contaminated eating utensils cannot be seen with the naked eye; therefore, the average person cannot predict the presence of contamination on eating utensils. One possible source of contamination or contamination in food is eating utensils. Eating utensils contaminated with bacteria can cause disease. The washing stage of cutlery is a factor that can cause contamination of cutlery [2]. Bacteria in cutleries are examined using the swab method. The types of identified bacteria were *Bacillus sp*., *Enterobacter hafniae*, *Enterobacter cloacea*, *Enterobacter aerogenes*, *Acinobacter calcoaceticus*, *Alcaligenes faecalis*, and *Klebsiella sp*. Contamination also comes from food handlers too [3]. The existence of a canteen in an institution plays an important role in maintaining the health of its customers. Therefore, cleanliness and sanitation in the canteen must be maintained, including the equipment [4]. Cutlery sanitation in school location does not use draining water and largely storing the cutleries in open rack. Therefore, several types of bacteria in cutlery are founded, like

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Bacillus sp., *Enterobacter hafniae*, *Enterobacter cloacea*, *Enterobacter aerogenes*, *Acinobacter calcoaceticus*, *Alcaligenes faecalis* and *Klebsiella sp*. Personal hygiene of canteen in this school is still less regarding maintaining hand hygiene[3].

This paper intends to conduct a hygiene and sanitation study in a laboratory workers' canteen by looking at the growth of *E coli* and *Salmonella sp.* bacteria found on eating utensils using the swab technique. Since this is the first-time hygiene in cafeteria at Pulogadung, East Jakarta has been examined, this is a novelty in this study.

2 Materials and methods

2.1 Materials

The samples used were 6 samples, consisting of 2 spoons, 2 plates, 2 glasses. The sample criteria used were cutlery that is often used by cafeteria users at a laboratory in the Pulogadung area, Jakarta. The tools and materials used are test tubes, autoclaves, incubators, Bunsen, ose wire, matches, petri dishes, test tube racks, distilled water, media: *Tryptic Soy Agar* (TSA), *Tryptic Soy Broth* (TSB), *Macconkey agar, Macconkey broth, Rappaport, Xylose Lysine Deoxycholate Agar* (XLDA).

2.2 Methods

Tools and materials are sterilized first using an autoclave, the media is first weighed according to the dosage of the media and dissolved using boiling water. This study was carried out with qualitative and quantitative identification. Before swabbing samples, researchers wash their hands and use gloves first so that there is no cross-contamination between bacteria on their hands and eating utensils. The samples that have been collected are then swabbed using a cotton swab.

This swab method according to ISO 18593:2018 standard. Samples that have been swabbed using a cotton swab are put into a test tube containing 10 mL of TSB (*Tryptic Soy Broth*) media. The tubes that have been identified are placed closed on the test tube rack, then slowly open the test tube lid, and place the work location close to the reach of the Bunsen flame. After that, pipette 1 mL into a petri dish, then pour 25 mL of liquid TSA (*Tryptic Soy Agar*) media and the media temperature is between 40-37^{o}C, then incubate for 3 days at 35^{o}C. Likewise, other tubes containing cotton swabs sample results were incubated at 35^{o}C for microbial cultivation. Specific microbial tests for *E coli* and *Salmonella* were performed the following day.

Furthermore, in the specific microbial test, *E coli* identification was carried out by taking 1 mL of TSB liquid in each tube and adding MCB (*MacConkey Broth*) media up to 100 mL and incubating at 43^{o}C. Meanwhile, to identify *Salmonella*, 0.1 mL of TSB liquid is pipetted, then put into a sterile 100 mL bottle then add RPT (*Rappaport*) to 10 mL then incubate at 35^{o}C. Each incubation lasted 1x24 hours. Observe the media color changes that occur on the MCB and RPT the following day. Scratch the MCB media using ose wire loop into the MCA (*MacConkey Agar*) media. Meanwhile, the RPT media was streaked on to XLDA (*Xylose Lysine Deoxycholate Agar*) media. Incubation then continued in an incubator at 35^{o}C. The analysis results are declared positive if colonies grow on the growth medium and vice versa. This test is carried out using the Most Probable Number (MPN).

3 Results and discussion

The Most Probable Number (MPN) technique is used to detect the number of microorganisms from a sample, especially when the number of microorganisms is less than 10 g or 10 mL of the sample, for example samples with different amounts (for example 100, 10 or 1 g or mL). This technique uses

media for sample inoculation. After incubation, the number of positive media is determined by looking at growth (turbidity) and gas formation. Selective media can be used for specific microorganisms. This technique can be used to calculate the total number of microbes, for example, *Salmonella*, *Staphylococcus*, *Enterococcus*, *Vibrio parahaemolyticus*, *Escherichia coli*, *coliforms*, *faecal coliforms*, and others [5]. The results of swab analysis from samples of cutlery in the canteen showed that there was bacterial contamination on the cutlery as stated in data **Table 1**. However, identification of *E coli* and *Salmonella* showed negative results.

Table 1. Result of amount of microbial growth

No.	Sample	Number of Microbes (colony)			*E coli*	*Salmonella*
		Day 1	Day 2	Day 3		
1	Spoon 1	20	35	40	-	-
2	Spoon 2	12	20	55	-	-
3	Plate 1	30	45	60	-	-
4	Plate 2	35	56	76	-	-
5	Glass 1	27	54	60	-	-
6	Glass 2	46	55	67	-	-

The medium used for the specific E coli test is MCB (*MacConkey Broth*). This media contains lactose and bile salts which function to grow enteric bacteria so that they can inhibit the growth of non-enteric bacteria. Enteric bacteria can grow because the MCB medium is useful for fermenting lactose into acid and gas. Positive results in this test can be seen from the formation of gas and the formation of acid which is indicated by a colour change in the media, from purple to yellow [6], [7]. **Figure 1** shows that there was no change in the TSB media, it means that no *Salmonella* or *E coli* microbes were detected in the swab sample.

Fig. 1. Swab results in broth media

The discovery of microbial growth in the media indicates that the sanitation at the laboratory canteen location does not meet the requirements. According to Regulations of the Health Ministry of the Republic of Indonesia No. 1096/Menkes/Per/VI/2011, the microbial contamination contained in eating utensils must be zero to meet health standards. Microbial contamination can be identified by looking at the growth on TSA (*Tryptic Soy Agar*) media like in **Figure 2**. The microbial contamination contained in the sample could be due to the water used for washing dishes being contaminated, or it could also be that the water used for washing dishes is not running but is placed in a fixed container so that if there are microbes in the container it will contaminate all the cutleries that washed with water in the container.

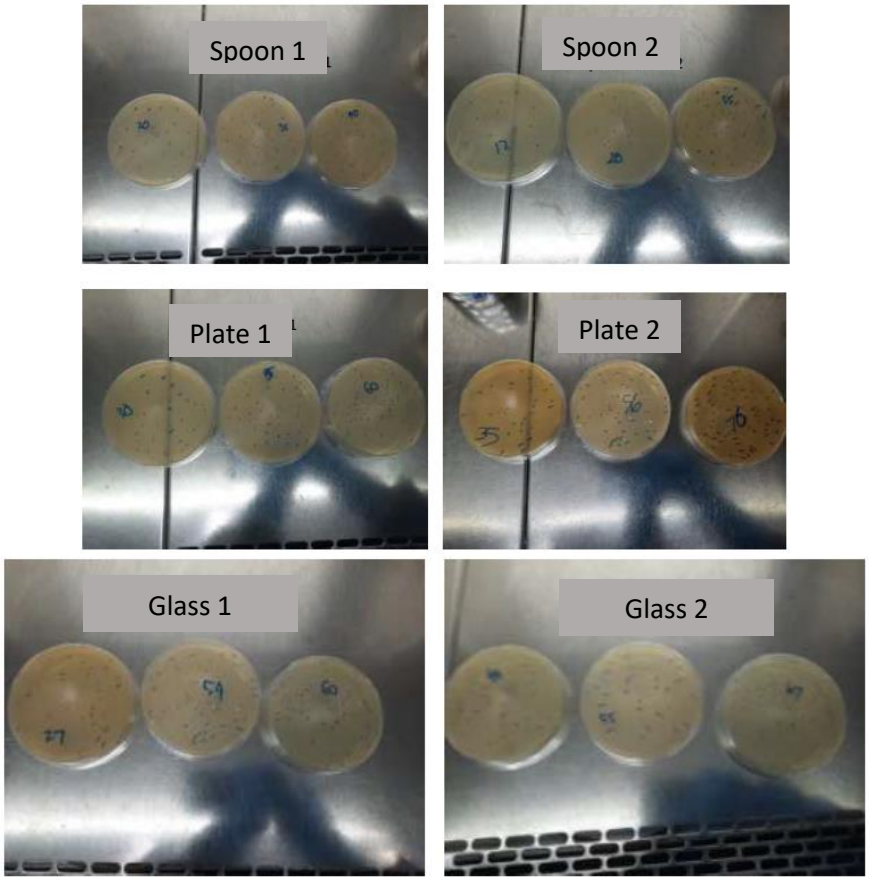

Fig. 2. Microbial growth results in agar media

According to Budon, basic knowledge about washing canteen equipment is very important because with good washing, the tableware will be kept clean and healthy, thereby avoiding contamination from pathogenic germs. According to Regulations of the Health Ministry of the Republic of Indonesia No. 1096/Menkes/Per/VI/2011, apart from not allowing any bacteria at all on eating and drinking utensils (hygiene requirements are that they must contain 0 (zero) colony/cm^2), the surface of eating utensils must also not be cracked or rough because there is concern about the release of material cutlery ingredients to food. The identified microbiological hazards are the number of bacteria on spoons, glasses, and ladles. Contamination prevention measures that can be applied at identified critical control points (CCP), namely at the scraping, washing, rinsing, sanitizing and drying stages [2]. Scraping that is missed will result in food residue or dirt on the surface of the equipment and will hinder washing with soap. Apart from that, food waste that is not cleaned first will be scattered around the washing area and become a source of contamination. On the other hand, careless scraping will cause scratches/small gaps on the surface of the equipment which are susceptible to becoming a breeding ground for microorganisms, therefore the scraping stage is a CCP.

Soaking is included in the CCP if food residue has dried or hardened on the surface of the cutlery. Thorough cleaning of equipment surfaces through washing and rinsing steps is a critical control point before sanitizing. Sanitizing will not be effective if done on equipment surfaces that are still dirty. Sanitizing is specifically designed to eliminate the danger of pathogenic bacteria that are still present but invisible on the surface of equipment. Placement of eating utensils should be far from trash cans or places where food waste is disposed of. Furthermore, complete drying of the equipment must be done as much as possible to prevent biofilm from forming. Canteen employees still apply wiping steps which are considered to increase cleanliness and do not understand that rags or napkins can be

a source of contamination. Rags or napkins are one of the most significant sources of contamination in the kitchen area. The risk of recontamination by pathogenic germs due to wiping is greater than the expected cleanliness results [10].

4 Conclusion

In this study, it was concluded that all the samples tested did not meet health standard requirements. For this reason, in the future, canteen managers are obliged to maintain and pay attention to hygiene and sanitation in the canteen environment, starting from the water used for cleaning, dishwashing, and cutlery storage. A healthy lifestyle in harmony with the concept of sustainability in life will have a significant positive impact on the next generation.

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