



Testing the Quantity and Types of Bacteria in Laptops Before and After Being Cleaned

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Abstract

Background: Laptop which is always in contact with the hand during working may act as a medium of transmission of the disease.

The Objective: The researchers conducted a bacteriological test on laptops to know the quantity and type of bacteriological laptop.

Method: Using cross-sectional design, the analysis was conducted on 36 samples of laptops owned by students and lecturers of Health Polytechnic Minister of Health Jakarta Indonesia. The number of germs was determined through the method of Standard Plate Count (SPC) and to determine the type of bacteria the Streak Plate Method (SPM) was employed. The bivariate analysis was performed to assess the relationship of cleanliness to the number of germs.

Results: The decline in the average number of germs between before and after the examination as much as 1457.67 colonies (96.08%). P -value = 0.235 > 0.05 means that there is no significant effect of the average number of bacteria before and after cleaning. The results of the examination of specific pathogenic bacteria either Salmonella, Shigella, and Escherichia coli was not found in the laptop of students and lecturers.

Conclusion: It is suggested laptops are often cleaned with a dry tissue to prevent an increase in the number of germs' colonies and do the regular cleaning with a natural disinfectant.

Keywords: bacteria, quantity, laptop, cleaning.

Introduction

In the modern era, laptop serves as a medium which is very helpful in supporting person's job. With the frequent use of laptops, the hand hygiene is very influential on laptop cleanliness.

The hand is part of the human body that acts as a medium of transmission of the disease from one place to another through various media, air, water, and soil. Pathogenic bacteria into the human body

can also be transmitted through a variety of media including a laptop. In addition to these germs, respiratory tract infections also spread through the surface of the object. Contaminants on the surface of the object can be in the form of microorganisms. There are various kinds of microorganisms such as viruses, molds, fungi, and bacteria algae. The bacteria are a group of bodies most likely to cause diseases ranging from disease present in the

mouth and respirator until that occurs within the circulatory system (Irianto, 2014). Not to wash hands first before using laptops allow removal of germs from the laptop into the mouth through food that may cause gastrointestinal diseases. In addition to the laptop position when in use, there is a chance that laptop surfaces are contaminated by microorganisms or bacteria through the medium of air in the form of droplets and dust. Therefore, researchers are interested in examining the number of germs and pathogens to the laptop to determine whether the number of bacteria in the laptop used daily by both the faculty and students exceeds the usual standards. The researchers use a standard amount of germs of 1 colony of microbes / cm² and disinfected pathogens to declare that the laptop is in excellent hygiene.

Material and Method

This study used a *cross-sectional* design in the Department of Environmental Health Laboratory of the Ministry of Health Polytechnic Jakarta II, Indonesia. Samples were the laptop of students and faculty staff. The number of polytechnic students' laptop from the Department of Environmental Health is 151 pieces and 18 pieces

belonging to the lecturer bringing the total amount of 169 units. If the population is more than 100, it may be taken out 10% as samples (Suharsimi, 2006). Thus, researchers took 20%, making the total is = 20% X 169 (total population) = 34 making the total sample of 36 pieces consisting 18 laptops of lecturers and 18 laptops of students are within the acceptance level limit. Samples are collected for examination to determine the magnitude of the number of germs through the method of Standard Plate Count and Streak Plate Method to determine the type of bacteria used. The standard plate count method is an indirect measurement of cell density and reveals information related only to live bacteria. Streak plate technique is used for the isolation into a pure culture of the organisms (mostly bacteria), from a mixed population (Waluyo Lud, 2009). Data examination is carried out with a descriptive analysis to determine the number of germs and bivariate analysis is used to determine the relationship of the cleanliness of the laptop with the number of bugs on the laptop.

Results and Discussion

The primary results are presented in the following tables.

Table 1. 1 Total Average of Germs Per-Square in Laptop Before and After Cleaning

No.	Descriptions	Number of germs per-square (Students)	Number of germs per-square (Lecturers)	Average	%
1	Average before cleaning	190.855	11.770	5.628	
2	Average after cleaning	6.350	0.670	0.195	
	Decreasing	184.505	11.100	5.433	96.54

Table 1 reveals that the average total of germ on students and lecturers' laptops before cleaning is 5.628 colony and after washing is 0.195 colonies indicating the elimination up to 96.54 %.

Table 2. The Average Number of Bacteria Per-Square in Laptop Before and After Cleaning

No.	Descriptions	Number of bacteria per-square (Students)	Number of bacteria per-square (Lecturers)	Average	%
1	Average before cleaning	50.707	3.345	1.50	
2	Average after cleaning	1.392	0.184	0.43	
	Decreasing	49.315	3.161	1.07	97.08

Table 2 shows that the average total of bacteria on students and lecturers' laptops before cleaning is 1.50 colony and after washing is 0.43 colonies specifying the reduction of the colonies up to 9708 %. However, the type of bacteria like *Salmonella*, *Shigella* and *Escherichia coli* are negative / not found on all laptops inspected both before and after cleaning. Standart bacteriological quantity on the laptop use a size based on the size of the number of germs on cutlery which is based on decree of Indonesia Health Minister regarding requirements sanitation hygiene that cutlery is

qualified if the number of colonies of microbes is 1 colony per cm² the most (eligible if ≤ 1 colony / cm²) (Kemenkes RI, 2015). The results obtained the units per cm² average number of germs before cleaning 1.5 per cm² (not eligible) and after sweeping the average number of germs is dropped to 0.43 (qualified).

The result of the bivariate analysis to determine the relationship of the cleanliness of the laptop with the number of germs on the laptop is presented in Table 3.

Table 3 Bivariate Test Result

Total germ	Mean	SD	Sig. (2-tailed)
Average before cleaning	15.3089	73.83094	0.235
Average after cleaning	0.4589	1.86456	

The average number of germs on laptops of students and professors per cm² before cleaning is 1.501 colonies reflecting the condition does not qualify for cleanliness by referring to cutlery hygiene requirements as required by decree of Indonesia Minister of Health Number: 715 / Menkes / SK / V / 2003 that cutlery is compliant if the number of germs colonies is 1 colony per cm². Ineligibility is likely due to a variety of causes due to the contamination through the medium of hand when the finger of users perform any work on the laptop and not to wash hands first before using laptops (based on interviews with respondents). The contamination could be in the form of dust and droplet. The laptop used at any time anywhere located right in front of faces when working are is most likely to be contaminated by bacteria.

After the samples were taken on the laptop and cleaned using a dry tissue, the average results number of bacteria colonies is 0.43/cm². The results indicate that the condition of the laptop was eligible in cleanliness as required in the decree of Indonesia Minister of Health Number: 715 / Menkes / SK / V / 2003 that cutlery is compliant if the number of germs colonies is one colony per cm². That condition illustrates that the

laptop cleaned using dry tissue would eliminate both specks of dust containing germs carried through the medium of air and the dirt transported by fingers (Maryunani, 2013).

The bacteria of *Salmonella*, *Shigella* and *Escherichia coli* are not found on all laptops inspected. The situation illustrates that the laptop of students and teachers are free of pathogens.

Shigella is an intestinal pathogen germ has long been known as bacillary dysentery disease-causing agents. The transmission mechanism of *Salmonella* and *Shigella* is through contaminated food and drink. *Escherichia coli* is the pathogen that comes from feces and the habitat is in the digestive tract in both humans and animals with the transmission media of water, soil, and food. The absence of the three bacteria describes the personal hygiene of students and faculty has been well conducted.

The average number of germs on the laptop before cleaning is 73.83094 with a standard deviation of 15.3089. Further, the average number of germs on laptops that have been cleaned is 0.4589 with a standard deviation of 1.86456. Statistical test results obtained p-value = 0.235 greater than 0.05 meaning there is no significant difference in the average number of germs between before and

after cleaning. The absence of the difference is likely due to dry tissue disinfectant is less efficient, and there is a possibility the number of samples is small.

Conclusion

The results of the research are summed up as follows:

- 1) Total germ average on the laptop before cleaning is higher than the number of germs average on a laptop after cleaning
- 2) There are no pathogenic bacteria of *Salmonella*, *Shigella* and *Escherichia coli* found.
- 3) The decrease in the number of bacteria before and after washing the students and faculty laptops per cm^2 is 1.501 colonies - 1.457,67 colonies = 0.43.78 settlement (96.08%).
- 4) P- value = 0.235 greater than 0.05 meaning that no significant effect of the average number of bacteria before and after cleaning.

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