

HAND SOAP ACTIVITY AGAINST THE NUMBER OF BACTERIAL COLONIES FROM THE HOUSEWIFE'S HAND SWAB SAMPLES IN A TEMPORARY LANDFILL IN KELURAHAN GADANG BANJARMASIN

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Abstract: *Unhygienic waste handling in a temporary landfill, can make the surrounding environment a source of transmission of pathogenic bacteria and colonization of bacterial growth in the hands. The study aims to identify the type of bacteria on the hands and test the activity of hand wash soap in lowering the number of colonies of hand bacteria. The identification of bacteria against 30 hand swab samples derived from the hands of housewives in temporary landfill (TPS) in Kelurahan Gadang Banjarmasin, was carried out in conventional media. Test the activity of hand wash soap in lowering the number of colonies of hand bacteria using 2 different brands. Bacterial identification is carried out by descriptive method and experimental testing of hand wash soap activity use pretest-posttest design with control group design. The data was analyzed using shapiro wilk test and wilcoxon test with 95% confidence level. Identification of hand swab bacterial isolates obtained Staphylococcus aureus (66.6%), Staphylococcus epidermidis (10%) and Escherichia coli (23.33%). Statistical analysis showed significant differences between the two brands of hand wash soap tested (sig. 0.000 >0.05). The conclusion of the type of gram-positive bacteria more widely found in the hands of housewives; Type B hand soap has a higher effectiveness in reducing the number of bacterial colonies on the hands than A-brand.*

Keywords: *hand wash soap, housewife hand swab, number of colonies of hand bacteria.*

INTRODUCTION

Unhygienic community behavior in its environment will cause environmentally based diseases in the community itself. Waste management in temporary landfill (TPS) that are less attentive to health aspects can cause disease either in tps workers themselves or in communities around TPS. Unhygienic waste management can make the surrounding environment a source of transmission of pathogenic bacteria and can increase the growth or colonization of bacteria on a person's hands.

Common types of bacteria found in the hands are *Bacillus sp.*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Streptococcus pyogenes*, *Staphylococcus saprophyticus*, *Escherichia coli*, *Salmonella sp*, *Pseudomonas aeruginosa*, and *Enterobacteriaceae*.^{1,2,3} The results of previous research have found a type of *Staphylococcus aureus* (*S. aureus*) and *Escherichia coli* (*E. coli*) bacterial isolate found in the hands of people living in river banks in Banjarmasin.^{4,5,6} The presence of bacteria on the hands is related to a person's behavior in hand washing. Bacteria in the hands can transmit infectious diseases of the gastrointestinal tract such as diarrhea and typhoid fever.^{1,2,4}

The prevalence of diarrhea in Indonesia, based on the diagnosis of health workers and symptoms in 2018 is 8% and the prevalence of diarrhea in South Kalimantan is 6%.⁷ Data of Puskesmas Gadang Hanyar in Banjarmasin, mentioning the number of diarrhea pain in the community in 2017 is quite large, which is 887 cases per year.^{8,9} One of the TPS in Banjarmasin City, located in Kelurahan Gadang Hanyar Banjarmasin, it is located near Gadang Market and is in a fairly congested community housing environment.^{9,10} Information of people residing around TPS environment, garbage waste in TPS Gadang in addition to coming from Kelurahan Gadang also comes from several kelurahan in Banjarmasin City; TPS capacity is inadequate and causes waste to spill into the surrounding community environment. This situation can have a negative impact on the environment of the surrounding community.¹⁰

The role of housewife, has the potential to be sufficiently targeted to come into contact with garbage and its unhealthy environment, so that housewives need to always implement clean and healthy living behaviors, especially those located around the TPS environment.¹⁰ Clean and healthy living behaviors, such as hand washing using hand soap and running water are one of the cheapest and most effective forms of health interventions preventing infectious diseases by hand-transmitted bacteria.

The correct way and step of hand washing behavior, using antiseptic soap and water can reduce or kill bacteria found in the hands.^{11,12} There is a difference in the number of bacterial colonies on the hands between groups that wash hands with soap and running water compared to controls (without hand washing).^{11,12} Hand wash soap generally contains antibacterial compounds triclosan.^{13,14} Triclosan has a broad spectrum, has good antibacterial power for gram positive and negative bacteria. Triclosan works by inhibiting the biosynthesis of bacterial cell membranes.^{13,14}

This research aims to identify the type of bacteria on the hands of housewives in temporary landfill in Kelurahan Gadang Banjarmasin and test the activity of hand wash soap in lowering the number of bacterial colonies on the hands. The population in this study was 30 respondents of housewives living in temporary landfill environment in Kelurahan Gadang Banjarmasin.

RESEARCH METHODS

The research method used there are 2 descriptive methods with cross sectional approach to identify the type of bacteria from the housewife respondent's hand swab sample and experimental method with pretest-posttest design with control design, to test the activity of liquid hand wash soap with triclosan content from 2 different brands (brand-A and brand-B). The research population is housewives who live in temporary landfill in Kelurahan Gadang Banjarmasin.

The study sample was as many as 30 hand swab samples from respondents of

housewives, taken with purposive sampling techniques. Identification of the type of hand bacteria is carried out against 30 hand swab samples before being given hand wash soap treatment. In the hand wash activity test, 30 hand swab samples were divided into 2 treatment groups, the first group got A-brand hand wash soap treatment and the second group got B-brand laundry soap treatment. The controls on this study are sterile aquades swabs. The observed parameters are the number of bacterial colonies before and after treatment with A-brand and B-brand hand soap. Data analysis use *Shapiro-Wilk and Wilcoxon tests* with 95% confidence level.

This research was conducted in the microbiology laboratory of the Faculty of Medicine, University of Lambung Mangkurat Banjarmasin. Research time in September-December 2019. Hand swab specimens from housewives residing in temporary landfill environment TPS Kelurahan Gadang Banjarmasin, sterile cotton lidi, gram dye paint, blood order media, Mac Conkey, Bouillon MSA media (Manitol Salt Agar), Nutrient agar media, boillon media, H₂O₂ 3%, 0.5µg novobiocin disk, Citrat media, SIM media (Sulphite Indol Motality), KIA media (Kliger Iron Agar), LIA media (Lysine Iron Agar), standard biochemical test media, sterile aquadest, NaCl, alcohol, and dry ice.

Each tube containing samples is partially sampled aseptically to be planted in isolation media (Agar Darah dan Mac Conkey) and incubated at 37°C, 24 hours. Microscopic identification of bacteria using gram staining. Conventional macroscopic identification of bacterial isolates growing in isolation media and in biochemical testing (fermentation) media. Prepared aseptically the tubes contain Builon media and hand swab samples before and after treatment with a type of A-brand and B-brand hand soap. Swab sampling from each tube is carried out a series of dilution and then each sample is planted evenly on the surface of the nutrient media so that the plate (AN) and incubation is carried out at a temperature of 37°C, 24 hours. Colonies of bacteria that grow on AN media from each

test treatment, then calculated the amount using colony counters.

Identification of types of hand bacteria is descriptively analyzed, based on microscopic and macroscopic features and properties and based on biochemical test results. Data on hand soap activity against the number of hand bacteria was analyzed with statistical tests at a 95% confidence level. Test the normality of the spread of research data using *saphiro-wilk test*. Analysis to determine whether there is any difference in influence before and after treatment using A-brand and B-brand hand wash soap using *Wilcoxon test*. Test the different effects of A-brand soap treatment with B-brand using *Mac Nemar test*.

RESULTS AND DISCUSSIONS

The identification results of 30 samples of housewife hand swabs samples in temporary landfill in Kelurahan Gadang Banjarmasin, obtained 3 types of hand bacterial isolates as shown in Figure 1.

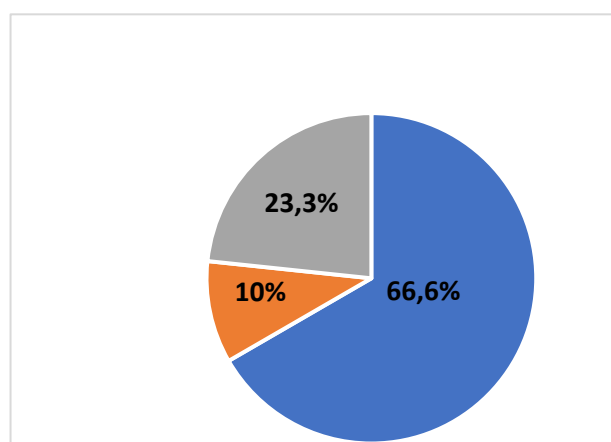


Figure 1. Types of Bacterial Isolates from Housewife Hand Swab Samples

Figure 1 shows the type of bacterial isolate found on the hands of housewives is the gram-positive bacterial group *Staphylococcus aureus* (66.6%) and *Staphylococcus epidermidis* (10%) and only found one type of gram negative bacteria *Escherichia coli* (23.33%).

The results of the analysis of data on the number of colonies of hand bacteria before and after treatment with A-brand and B-brand hand wash soap on hand swab samples found a difference in activity from hand wash soap

treatment tested in lowering the number of bacterial colonies, as shown in Figure 2 and 3.

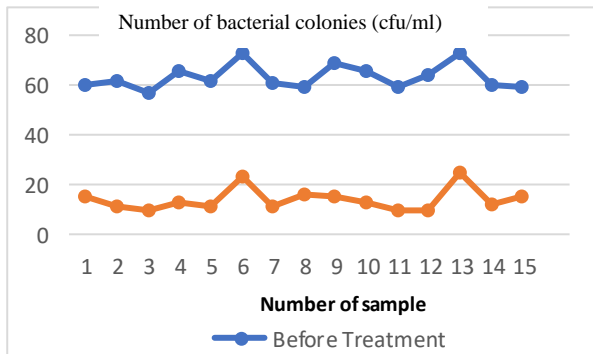


Figure 2. Number of Bacterial Colonies Before and After Treatment with A-Brand Hand Wash Soap

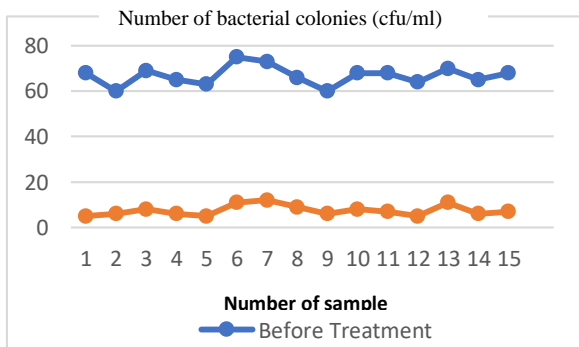


Figure 3. Number of Bacterial Colonies Before and After Treatment with B-Brand Hand Wash Soap

Table 1. The Difference A-brand and B-brand Hand Wash Soap Activity to Decrease Number of Bacterial Colonies

Number of bacterial colonies	Man Withney Test
A-Brand	46
B-Brand	58
	0,001 (p<0,005),
	Z
	2.941
	Asymp. Sig.
	.003
	Exact Sig.
	.003 ^b

The factors that affect the absence of bacteria on the hand are divided into 2, the reversible factor and irreversible factor. Factors that can be changed include hand washing habits, activity, sunlight exposure, skin

protection creams (cosmetics). Irreversible factors include skin moisture level, humidity in the air environment, age and gender.^{5,6,14} High humidity will increase the moisture content in the air. Extreme air temperature and humidity can be related to poor air quality. Air humidity is one of the factors that affects the survival of microorganism and amount of air bacteria. Air in summer or dry carries more bacteria than in winter or rain. The diseases it cause as airborne diseases.¹⁵

The results of this study were not different from the results of previous studies that identified the type of bacteria on the hands in people living in the river-crossing environment of Banjarmasin City; acquired isolates of *Staphylococcus aureus* type about 67.5-67.7% and *Escherichia coli* about 23.3-33.3%.^{4,5,16} *Staphylococcus aureus* and *S.epidermidis* are normal flora bacteria found in the human skin, airways and human gastrointestinal tract, while *Escherichia coli* is a normal flora bacterium in the human gastrointestinal tract.^{1,2,16}

Staphylococcus aureus has the ability to produce alpha hemotoxins that allow these bacteria to penetrate barrier skin defenses and lysis cells in humans. The presence of *S. aureus* on the hand can act as a contaminant agent in the food a person consumes and can cause food poisoning with a quick onset between 2 to 8 hours. Contamination of *S. aureus* in foods containing carbohydrates and high protein, triggers the growth of *S.aureus* to produce a potted enterotoxin in the gastrointestinal tract that manifests clinic such as nausea, vomiting, stomach cramps and diarrhea.^{1,2,15} Infection *S. aureus* on skin tissue can be accompanied by an abscess. Other *S. aureus* infections include ulcers, acne, impetigo, and wound infections.^{1,2}

Staphylococcus epidermidis in addition to being a normal flora of the gastrointestinal tract as well as on human skin. These bacteria can produce toxins and biofilms that make it easy to stick, including on the surface of tools made of plastic or glass. Biofilm, makes *S. epidermidis* more resistant to phagocytosis by the immune system and certain antibiotics. Localized infections by *S. epidermidis* such as acne, hair follicle infections or abscesses and

can cause inflammation or supuration, and pus.^{1,2}

The discovery of *Escherichia coli* on the hands can be used as an indicator of the contaminants of the bacteria derived from faeces, due to the hands that are not washed clean when defecating. *Escherichia coli* acts as a pathogen that can be found in human faeces which is about 10^6 - 10^9 cells per gram of faeces. *Escherichia coli* is a bacteria that is used as an indicator of water quality which is a risk factor for diarrhea.^{1,18,19} The discovery of bacterial contamination derived from faeces on the hands can be used as one indicator to evaluate the cleanness of a person's hands.^{1,18,19}

The presence of *Escherichia coli* can be obtained from *coliform* contamination in water used for domestic activities or hand washing. *Coliform* bacteria can contaminate water and follow the flow of piping water used by people in the environment around landfills. Test of MPN *coliform* piping water from community houses in temporary landfill environment TPS Kelurahan Gadang Banjarmasin, obtained a value of 2.0-7.5 MPN/100ml water samples.²⁰ In housewives who every day in their activity use piping water contaminated by coliform bacteria (*E.coli*), it can make *E.coli* in hands.

Images 2 and 3 show the activity of A-brand and B-brand hand soap in reducing the number of bacterial colonies found in the hands. Using hand wash soap when washing your hands, it cannot completely eliminate the amount of hand bacteria. *Saphiro-Wilk test* results were obtained a value of $p = 0.057$ which indicates the spread of this research data is not distributed normally. *Wilcoxon test* results, obtained a value of $p = 0.001$ and a value of $z = -3419$ ($p < 0.005$), which indicates there is a meaningful difference in the effect of hand washing with brand A soap and brand-B on the amount of hand bacteria; there is a decrease in the number of bacteria after hand washing treatment using hand wash soap A and B. A-brand soap treatment can decrease the average number of colonies 46 cfu/ml and the average B-soap treatment of the number of colonies 58 cfu/ml. B-brand

soap treatment has a greater effect in lowering the number of hand bacteria compared to A-brand soap.

Soap contains a collection of compounds consisting of one or more types of amino acids or their equivalents and alkalis; antibacterial content and degree of acidity (pH) in hand wash soap play a role in inhibiting bacterial growth. Triclosan or phenoxyphenol is one of the antibacterial substances commonly found in antiseptic hand wash soap. Triclosan can be diabsorbsi through the skin and is non-allergic to non-mutagenic in short-term use. The 0.05-2% triclosan content in hand wash soap has the effect of inhibiting the growth of gram-positive bacteria (*S.aureus*) and gram negative (*E. coli*), but has a weak effect on fungi and viruses. The mechanism of action of triclosan is to damage the walls of bacterial cells. Triclosan works by inhibiting lipid biosynthesis, binding to the active side of the enzyme FabI (fatty acid biosynthesis gene I), i.e. a noyl-acyl carrier protein reductase (ENR) enzyme; FabI enzyme catalyzes the engolation system in fat synthesis and bacterial cell resistance, so the effect makes bacterial cell membranes lose their strength and function..^{11,20,21}

In this study, there were differences in the effect of A-brand hand soap treatment with brand B. Antibacterial activity is influenced by the content and composition of antibacterial substances contained in an antiseptic / hand wash soap. Antibacterial compounds in addition to triclosan found in A-brand hand wash soap also have a composition that is common in hand wash soap and is antibacterial such as sodium laureth sulfate, laureth-21, laureth - 6 carboxylic acid and glice. In hand wash soap B contains thymol, curcuma sativis oil and citrus medica. Thymol content is 0.2%, having a role in inhibiting bacterial growth.²³ Curcuma sativis which is a sedian extract or oil from herbal plants, is known to have influential antimicrobial activity with metabolic functions of bacterial cell walls, and effectively inhibits the growth of gram positive and gram negative bacteria. Citrus

medica has no toxic properties and has activity against several types of bacteria such as *Micrococcus luteus*, *S. aureus*, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Propionibacterium acnes* and *Salmonella typhi*.^{24,25}

The results of this study are not much different from previous research on the activity of hand wash soap with triclosan and triclocaban content in reducing the number of bacterial colonies on the hands of school students domiciled in the river banks of Banjarmasin City.¹³ Triclosan benefits in antiseptic soaps or skin soaps are known to be antibacterial, but some studies say the negative effects of triclosan use on the long term in addition to impacting organs in the body also trigger the onset of bacterial resistance.^{20,21}

The addition of herbal plant extracts in the appropriate composition of hand wash soap, can increase soap activity to decrease the colonization of bacteria on the hands. The addition of extract / oil from an herbal plant that has been known to have antimicrobial activity, can be considered to be added in the manufacture of hand washing. Herbal plant extracts in addition to having a role in increasing the effects of inhibiting microbial growth, can also give a distinctive aroma as a therapeutic aroma.

CONCLUSION

The conclusion in this study is the type of gram-positive bacteria more widely found in the hands of housewives living in the neighborhood of TPS Gadang Banjarmasin. B-brand hand soap types have a higher effectiveness in reducing the number of bacterial colonies in the hand than A-brands.

AUTHORS' CONTRIBUTIONS

All authors contributed equally to this research.

ACKNOWLEDGMENTS

Funding/support: This research was supported by Faculty of Medicine Lambung Mangkurat University from grant fund in 2019. We thank to Puskesmas Gadang Hanyar in Banjarmasin City, housewives in temporary landfill in Kelurahan Gadang Hanyar, and the anonymous referees for their useful suggestions.

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