IDENTIFICATION OF BACTERIA, FUNGI, AND MOST PROBABLE COLIFORM AROUND TEMPORARY DISPOSAL SITE AT GADANG VILLAGE BANJARMASIN

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Abstract: Temporary Disposal Site (TDS) of Gadang Village Banjarmasin is one of the temporary landfills in Banjarmasin. *The negative effects of waste can pollute the environment, including water and air. The purpose of this study was to identify airborne contaminant bacteria and fungi as well as the Most Probable Number (MPN) of Coliform value of piped water in the residential houses around Gadang TDS Banjarmasin. The research method is descriptive observational. The sample of this study were air and piped water. Air sampling is done by open plate and MPN Coliform sampling was obtained by purposive sampling method. The results of this study showed the air contaminant bacteria in the house were Staphylococcus aureus (55.56%) and Escherichia coli (44.44%) in the environment around the TDS all results were obtained with the same percentage. Aspergillus niger was dominantly found at a distance of 20-30 m and 40-50 m while Aspergillus flavus was mostly found at the distance around 30-40 m. MPN Coliform in piped water showed coliform bacteria contamination with MPN coliform index of 2.0-7.5/100ml water samples. In conclusion, Staphylococcus aureus bacteria is more common than Escherichia coli. Most fungi species found in this study was Aspergillus niger. In the piped water examination for all samples MPN Coliform was found in the low risk category.*

Keywords: *Air contaminant bacteria, air contaminant fungi, piping water MPC coliform, Temporary Disposal Site*

INTRODUCTION

The rate of waste production in major cities in Indonesia, including Banjarmasin, continues to increase, not only in line with the rate of population growth, but also in line with the increasing consumption patterns of society. On the other hand, the waste management capacity carried out by the community and local government is still not optimal.[1] The negative impact of waste on society and the environment is the existence of pollution in the soil, water and air environment.[2] Garbage piles can contain various pollutants that cause air pollution. Air pollution is the presence of microorganisms such as bacteria and fungi as air contaminants.[1,3]

One of the t temporary disposal site in Banjarmasin is located in Gadang Village, Banjarmasin. The capacity of this TDS is no longer able to accommodate a large amount of waste so that a lot of garbage is scattered out of the TDS. This condition can cause pollution for the surrounding environment. Air contaminats bacteria can lead to various disease, not only for people around the site. It can spread to the community through air pollution, dust, and wind.[4,5] The result of a previous study about air contaminant bacteria obtained *Micrococcus sp., Aerococcus sp., Staphylococcus sp., Microbacterium sp., Streptococcus sp., Klebsiella sp., Corynebacterium sp., Pseudomonas* and *Bacillus sp*.[6-8]

Besides bacterias, air contaminant can be as fungi. As the community who lives close to the site will has bigger risk to be exposed with air contaminant fungi.[2,4] Microorganisms such as fungi roled as air contaminant which can stick with dust or in droplet. If there is a lot of dust in a room, you will find a lot of microorganisms in it. [9-11]

Banjarmasin is well known as a thousand river city with with a geographical swamp land which is influenced by the ebb and flow of swamp land water. The availability of clean and healthy piped water is a very important requirement for all communities. Therefore, it is very important to pay attention to water quality in terms of coliform bacteria. Coliform bacteria can come from leachate seepage in TDS. Water contaminated with bacteria can cause faecal oral diseases such as diarrhea and other digestive tract disease. Determination of the MPN value is a standard for determining the quality of water sources whether it is in accordance with health requirements and is suitable for community use.[12] Anes's research results in 2017, stated that the MPN coliform value of the clean water sample of PDAM Minahasa Unit Kawangkoang is around 2-140 MPN / 100 ml of water.[13-15]

The purpose of this research is to identify air contaminant bacteria and fungi along with coliform MPN value of piped water in the residential houses around Gadang TDS Banjarmasin.

RESEARCH METHOD

This research used descriptive observational method. The samp;e for this research are air and piped water obtained using purposive sampling method to identify bacteria and fungi in the air also the coliform MPN around Gadang TDS Banjarmasin.

The collection of bacteria and fungi in the air was carried out at the people's houses and the environment around the TDS using open plate method, there were 12 houses out of 120 houses around TDS Gadang and 4 points in the environment around the TDS, in the south, west, north, and east of the TDS. The sampling method used purposive sampling technique. The petri disk each contain blood agar medium, Mac Conkey medium and SDA + media. In each sample, 3 petri disks were placed as the isolation media. Th petri disks were left open for 15 minutes and closed with aluminium foil, aftr that left them in freezer or ice flask. All research samples were taken to the laboratory of the Medical Faculty of Lambung Mangkurat University

for microscopic, macroscopic, and biochemical tests.

Sampling of piped water from 12 houses was carried out by taking 100 ml of piped water from the kitchen faucets of the community houses around Gadang TDS Banjarmasin. After that the water sample bottle was closed again and wrapped in aluminium foil, then placed into an ice flask to be taken to the Microbiology Laboratory of Medical Faculty of Lambung Mangkurat University Banjarmasin, then an estimation and confirmation test were carried out.

RESULTS AND DISCUSSION

The results of air contaminant bacteria and fungi and coliform MPN from Gadang TDS environment can be seen in table 1, 2, and 3.

Table 1. Types of Air Contaminant Bacteria in Residential House and Surrounding Environment of Gadang TDS Banjarmasin

No	Types of Bacteria	Location			
		House		Environment	
		n	(%)	n	(%)
1	*Staphylococcus aureus*	10	55,56	4	50
2	*Escherichia coli*	8	44,44	4	50
	Total	18	100	8	100

Table 1 shows the percentage of types of air contaminant bacteria found in the houses of the community around the TDS of Gadang Village, Banjarmasin, where 10 isolates (55.56%) were found *Staphylococcus aureus* and 8 isolates contained *Escherichia coli* (44.44%). Whereas in the environment around the Gadang TDS Banjarmasin, *Staphylococcus aureus* was found in 4 isolates and 4 isolates with *Escherichia coli* with the same percentage of 50%. The results of the identification of airb contaminant bacteria in this study can be related to the surrounding environment.

Similar results were also obtained in previous research which identified types of air contaminant bacteria in classrooms, traditional market rooms, reading rooms, rice fields and garbage environments, that resulted bacteria such as *Micrococcus sp.*, *Staphylococcus sp.*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Aerococcus sp.*, *Microbacterium sp.*, *Escherichia coli*, *Acinetobacter lwoffii*, *Klebsiella azaenae* and *Propionibacterium acne*.[2-6]

At the time this research was carried out, the condition of the community houses, most of them, still lacked in fulfilling the category of healthy houses, several houses with minimal lighting and dusty floors. Several factors that can influence the types of airb contaminant bacteria are wind, humidity, and lighting.

Wind affects bacteria in the air.[6] The spread of bacteria in the air is due to the natural decomposition process of organic waste, which is the main effect of the waste dumping process in a TDS. The spread has the potential to increase bacterial exposure to residents who live around the TDS. The other factor is humidity. Humidity is the representation of steam contained in the air. The higher humidity means higher steam content in the air. A high rate of steam influences bacteria growth since air is a media for bacteria to survive in the air.[4] The lighting factor that is too high can interfere with the growth of some airborne bacteria, which will not survive long in the air. However, there are some bacteria that usually survive at high lighting levels, that is bacteria that can form spores to survive and spread into the environment without being affected by outside lighting.[2,5]

Table 2. Types of fungi Isolates in the Air in Community House Around Gadang TDS Banjarmasin.

No	Range	Total of Houses	Types of Fungi Isolates					
			Aspergillus niger		*Aspergillus flavus*		*Penicillium sp.*	
			(n)	%	(n)	%	(n)	%
1	20-30M	6	4	67%	1	17%	1	17%
2	30-40M	3	1	34%	-	0%	2	67%
3	40-50M	3	2	67%	-	0%	1	34%

Table 2 shows the results that the most found types of fungi is Aspergillus Niger at all observed ranges. The type of *Aspergillus flavus* was found only at a range of 20-30 m. Types of *Penicillium sp.* obtained at all observed ranges. From the results of this study can illustrate that the *Aspergillus niger* as the type of fungus that grows most in community houses around the TDS.

The overview of the community houses condition around Gadang TDS Banjarmasin generally has ventilation, allowing air circulation from outside into the house or vice versa. Humid house conditions can trigger the growth of fungi that are relatively the same and garbage scattered in the yard, so that the condition of the community house cannot be categorized as a healthy house.

Aspergillus niger was found in the environment around the TDS within range 5 meters. The factors that contribute to the distribution of mold spores in the air include ambient temperature, sunlight, wind direction, sampling time. Generally, a fungi grows at temperature 20℃ up to 30℃ and in humidity more than 65 %.[9] From this research resulted fungi isolate that dominate 1 media of SDA(+), that was *Aspergillus niger*, and the least dominant was *Aspergillus flavus*.

In term of air circulation, it is influenced by humidity to detain the growth and the distribution of the spore in the air. The spore can survive on dry condition in enough long time and will grow become a new fungus if the environment is suitable for fungi growth. In general, a fungus in the air as

contaminant or mold spore spread in the air through a mechanism called droplet adhesion, that is distribution proses of spore through grain dust or residue of dried droplet.[9,10]

Table 3. The Value of Most Probable Number Coliform in Piped Water from Community Houses around Gadang TDS Banajrmasin

No.	Houses	TDS Ranges	MPN Value	MPN Caterigy
1.	1st House	8 m	4,4	*Low risk*
2.	2nd House	10 m	7,5	*Low risk*
3.	3rd House	10 m	4,0	*Low risk*
4.	4th House	13 m	6,7	*Low risk*
5.	5th House	15 m	4,0	*Low risk*
6.	6th House	15 m	4,4	*Low risk*
7.	7th House	15 m	2,0	*Low risk*
8.	8th House	21 m	2,2	*Low risk*
9.	9th House	25 m	2,0	*Low risk*
10.	10th House	28 m	2,0	*Low risk*
11.	11th House	30 m	2,0	*Low risk*
12	12th House	40 m	2,0	*Low risk*

Table 3 shows that ranges between houses and TDS are in range 8 up to 40 metres. In the range at 1 – 30 metres found 11 samples with MPN coliform value gap 2,0-7,5/100ml water sample and 1 sample in range 31 – 4o metres with MPN coliform value gap 2.0/100ml sample. The gap of MPN coliform value is in view of the fact that the existence of coliform bacteria pollution, so that piped water is not yet suitable for direct consumption by the community.

Bacteriological term of water with coliform MPN level per 100 ml are 0 MPN/100 ml and does not contain coliform bacteria. Potable water also should fulfill physical, chemical, bacteriological, and radiactive terms.[12,13] polution of coliform bacteria in all of piped water sample in this research can be processed furthermore, so that can be consumed by boiling it first in order to turn it into potable water.[14,16] Coliform MPN value criteria based on WHO are divided into 3 categories: low risk when coliform MPN value is 1-10 cfu/100 ml of water; intermediate risk when coliform MPN value is 10-100 cfu/100 ml of water; and high risk when coliform MPN value is 100-1000 cfu/100 ml of water. Based on those criteria, the gap of coliform MPN in this research was in low risk category.[15,17]

The observation of waste condition in Gadang TDS Banjarmasin resulted that the waste had exceed the limit of its capacity and many waste scattered out of TDS so that when the rain comes, the leachate will be leak to the ground and contaminate the groundwater inside. Anes's research found coliform MPN values of 2-140 MPN / 100 ml of water samples from PDAM Minahasa Unit Kawangkoan water, which is suspected to be PDAM water, there is coliform bacteria contamination originating from the habit of people throwing animal waste directly around the river.[16]

Acidic leachate can cause corrosion in the water pipes in the ground over time. Corroded pipes cause leachate to enter the pipes which causes coliform bacteria to contaminate piped water. According to Sriwiria, the piped water was contaminated with coliform bacteria from feces, animal waste, garbage, urine and others, directly or through a leaked pipe.[16,17]

Several factors that affect coliform bacteria existance are population density, close distance of houses, distance between water source and household disposal, close by septic tank, and bowel habits of people who lives around the river.[18]

CONCLUSION

The conclusion of this research is *Staphylococcus aureus* isolate was more likely discovered as air contaminant bacteria than *Escherichia coli*; while the most types of fungi found in this study were *Aspergillus niger*. On the inspection of piped water for all samples, coliform MPN was found in the low risk category.

Further research can be carried out on the identification of airb contaminant bacteria in other TDS that are close to community settlements in the city of Banjarmasin and the relationship between the presence of coliform bacteria and the piping system in people's homes around the TDS in Banjarmasin City. The next research also can be carried on the relationship of physical factors such as wind and humidity to an increase in the number of airb contaminant bacteria. Research on contaminant fungi that causes ARI or dermatophytosis can be carried out in the community and workers in the TDS environment. Research on the types of fungi in the market environment near people's houses also can be carried out for further research.

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