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PROCEEDING

The 1st Seminar on Environment and Health

Toward SDG's Achievement 2030:
INTEGRATION SYSTEM
ON ENVIRONMENT AND HEALTH SUSTAINABILITY

PROCEEDING 1st SEHAT 2016

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PREFACE

First of all, kindly, I would like to give you a great gratitude for your attendance to this important event that is conducted by our department. As an education institution, we have tried to give our best in contributing our knowledge in the field of environmental and health, especially how we to realize development of environment continued model "integration system" among academics, stakeholders and business communities.

I hope, this international seminar will help us and -we believe- you too, to gasp more knowledge especially in integration system on environment and health. The special topic of this seminar is Toward SDG's Achievement 2030: Integration System on Environment and Health. We hope that you enjoy all programs in this seminar. Thank you

Dr. R. Azizah., S.H.,M.Kes
Chairman of 1st SEHAT 2016
Universitas Airlangga
Surabaya, Indonesia

WELCOMING SPEECH BY HEAD OF UNIVERSITY

Assalamualaikum wr wb..
Good Morning Mr. Chairman, Honourable Delegates, Ladies and Gentlemen:

Standing in front of you all, I feel great pleasure to speak this morning, to welcome you most cordially at the *1st Seminar On Environmental And Health Toward SDG's Achievement 2030: Intregration System On Environmental And Health.*

Ladies & gentleman, first of all , with the permission of the chairman, I would like to introduce and give a special welcome to our keynote speaker especially Mr. Sharad Adkary from World Health Organization. And also welcome to all of the experts participating here today from organizations, companies and government agencies cooperating with UNAIR, who will give presentations on different aspects of this issue.

Today's seminar is attended by 12 speakers, of course I would like to take this opportunity to express my sincere thanks to our honorable speakers. All of them have been working with us since the beginning of the planning stage and they are still here today for all of us, even though they are very busy with their responsibilities at their agencies. So, we truly appreciate your dedication.

Secondly, my precious thanks to all the participants who traveled far and near to share experience and to engage with each other. I truly believe the engagement of faculties from different universities attending today will certainly make this seminar fruitful and productive.

This seminar has been designed to be encourage participation and exchange information. Therefore, this seminar will provide us not only essential knowledge but also a great opportunity to share experiences, idea both technical and regulatory issues.

May I wish you all an informative and interesting seminar.
Thank you.

WELCOMING SPEECH BY DEAN OF FACULTY

Assalamualaikum wr wb.
Good morning, ladies and gentlemen :

It is my great pleasure to be a part of the opening ceremony this morning. My role is to welcome all of you, and to say a few words tying in with the theme of this seminar. Thereafter, I will let you get on with your important deliberations. The theme of this seminar is *"1st Seminar On Environmental and Health Toward SDG's Achievement 2030: Intregration System On Environmental And Health"*.

As Dean of the Faculty of Public Health, I would like to express my gratitude to all of speakers, sponsorship, participants whose generous support has made this seminar possible. I would like also to thank the organizing committee whose relentless efforts have made this kind of academic event a reality.

Although it is the first seminar event, we must congratulate the SEHAT seminar that providing a valuable forum in which many of the experts participating here today from organizations, companies and government agencies cooperating with UNAIR can lead discussions of the most interesting and challenging topics.

So whilst these seminar will continue tomorrow, let's enjoy the hospitality of this magnificent venue. Thank you to all the team here who have worked so hard in preparing for this morning. I hope that the seminar will accomplish all its aims and earnestly desire that all the participants will be able to benefit from the presentations and discussions and that this seminar will enrich our knowledge ourselves.

Thankyou.

SPEECH TEXT HEAD OF COMMITTEE

Assalamualaikum wr wb
Good Morning Ladies and Gentlemen;

One behalf of the Organizing Committee, my great pleasure to invite you to this SEHAT seminar. Thankyou very much for coming, a warm welcome to the beautiful Surabaya.

Let me begin by explaining: that college has a great work, so that it needs the support of a wide range of sectors for policy making. In addition it will be able to produce commonweal, this is another reason why networks is necessary encourage people to share knowledge and skills so that we can indeed share the best practice in a range of challenging roles internationally. I wish to take this opportunity to works together with strong support.

I hope the SEHAT 2016 will give us all the benefits of an excellent education and exercise science between another institutions and other parts of the world in the future.

Thankyou

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CLIMATE CHANGE CONCEPT ON ENVIRONMENT & HEALTH SUSTAINABILITY (SOME OF THE FACT FINDINGS ON CLIMATE CHANGE AND HEALTH)

Mr Sharad Adhikary
Environmental Health Officer
World Health Organization Country Office, Indonesia

ABSTRACT

Global climate change is thus a significant addition to the spectrum of environmental health hazards faced by humankind. The global scale makes for unfamiliarity—although most of its health impacts comprise increases (or decreases) in familiar effects of climatic variation on human biology and health. Traditional environmental health concerns long have been focused on toxicological or microbiological risks to health from local environmental exposures. However, in the early years of the twenty-first century, as the burgeoning human impact on the environment continues to alter the planet's geological, biological and ecological systems, a range of larger-scale environmental hazards to human health has emerged.

Climate change undermines the environmental determinants of health. Without effective responses, climate change will compromise of water quality and quantity that contributing to a doubling of people living in water-stressed basins by 2050; Food security were some African countries, yields from rain-fed agriculture may halve by 2020; control of infectious disease that increasing population at risk of malaria in Africa by 170 million by 2030, and at risk of dengue by 2 billion by 2080s; protection from disasters that increasing exposure to coastal flooding by a factor of 10, and land area in extreme drought by a factor of 10-30.

Over the last 50 years, human activities - particularly the burning of fossil fuels - have released sufficient quantities of carbon dioxide and other greenhouse gases to affect the global climate. In the atmospheric, concentration of carbon dioxide has increased by more than 30% since pre-industrial times, trapping more heat in the lower atmosphere. The resulting changes in the global climate bring a range of risks to health, from deaths in extreme high temperatures to changing patterns of infectious diseases. Some of the largest disease burdens are undernutrition kills 3,5 million, diarrhea kills 2,2 million, malaria kills 900.000 and extreme weather events kill 60.000. WHO estimates that the climate change that has occurred since the 1970s already kills over 140.000 people every year.

The Rio Conference on environment and development that while Rio+20 environmental, social, political and sustainable development. With the ongoing development of the pillar and 3 really hard realized. The main focus being the health in Rio in all spheres. Health in SDG's there are 3 indicators, 2 of them are noncommunicable disease and communicable disease. The data required by the provision of data, management, change, and access to use of such data is primarily the latest data.

Key focus areas are education & awareness, share knowledge and good practices, generation of evidence, build country capacity, inter-sectoral collaboration on health, environment & climate, resource mobilization, act on both mitigation & adaptation Adaptations to the health hazard posed by global climate change can be both proactive and reactive, and can occur at the macro, meso and micro-scales; that is, at the population, community and individual levels. Climate change represents a one-off global experiment so there will be limited opportunity to carry out preliminary evaluation of adaptation

options. There is therefore a strong case for prudence, both in mitigating climate change and in adapting to its impacts.

Keywords: climate change, environment, human health, adaptations, mitigations

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EVALUATION OF NON-REVENUE WATER USING STEP TEST METHOD AT PDAM MALANG

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ABSTRACT
Water Supply Company (PDAM) of Malang City has an attempt to improve water supply system. One of effort is by decreasing non-revenue water. The non-revenue water gives negative impact on the quality of water supply services. Current percentage of Non Revenue Water in the system of water supply in PDAM Malang is 19,7%. PDAM Malang has a target within the next 5 years percentage of Non-Revenue Water reduced to 16%. The aim of this research was to evaluate the decrease of water loss using step test method. The Case study located in Tlogomas 1E District Meter Area. The percentage of Non-Revenue Water in Tlogomas 1E District Meter Area on May 2016 is 51%. According on the results, there are a few things that cause Non-Revenue Water is high on that district, which is a lot of old rusty pipe that cause pipe leakage, bad service connections, and malfunction customer water meters. After done leak-detection using step test method, leaks were successfully located, verified and the pipeline leaks were repaired. Current percentage of non-revenue water in Tlogomas 1E District Meter Area is 44%. According to the result from step testing, the Non-Revenue Water in PDAM Malang can be reduced to 17% in one year.

Keywords: District Meter Area, Non-Revenue Water, and Step Test

INTRODUCTION

During recent years the development of Malang city causes some huge impacts. One of them is increasing amounts of populations. The growth of population makes water demand increased, diminishing water supply, environmental pollution, etc. Water Supply Company (PDAM) of Malang City has some efforts to improve quality, quantity, and continuity of water supply services. One thing that government can do to manage water demand and improve the water supply services is by reducing and managing water loss both physical losses and commercial losses. Physical losses, or leakages, divert precious water from reaching customers and increase operating costs. They also result in larger investments than necessary to augment network capacity (Hunaidi and Wang, 2006). Commercial losses, caused by customer meter inaccuracies, poor data handling, and illegal connections, reduce income and thereby financial resource generation.

By reducing water losses, water utilities have additional supply to expand services to undeserved areas (Farley et al., 2008). If a large proportion of water that is supplied is lost, meeting consumer demands is much more difficult. Since this water yields no revenue, heavy losses also make it harder to keep water tariffs at a reasonable and affordable level. This situation is common in many Asian cities “Non-Revenue Water” (NRW) (Frauendorfer and Liemberger, 2010). In effect, reducing Non-Revenue Water (NRW) releases new sources of both water and finances. Reducing excessive physical losses results in a greater amount of water available for consumption and postpones the need for investing in new sources. It also lowers operating costs. Similarly, reducing commercial losses generates more revenues. Current percentage of Non Revenue Water in the system of water supply in PDAM Malang is 19,7%. PDAM Malang has a target within the next 5 years percentage of Non Revenue Water reduced to 16% (PDAM Malang,

2015). The percentage of Non-Revenue Water in Tlogomas 1E District Meter Area on May 2016 is 51%. The aim of this research was to evaluate the decrease of water loss using step test method. Step test is one of method that can be used to locate the water loss caused by physical losses. In this study, a case study located in Tlogomas 1E District Meter Area.

METHOD

This study is to evaluate how many percentage of Non-Revenue Water in PDAM Malang city using step test method. Leakages tend to steal large volumes of water; the discrepancy will show up when PDAM conducts a flow balance analysis. To be able to determine how much water is lost in specific parts of the network, the network must be split in hydraulically discrete zones and the inflow to these zones must then be measured. By computing the volume of leakage in each zone, leak detection specialists can better target their efforts. Clearly, the smaller the zone, the better the information and the efficiency of leak detection. The smallest zones are called District Metered Areas (DMA). Water Supply Company (PDAM) should then undertake customer surveys and leakage step tests in selected DMA to determine where the missing flow occurs. Step testing involves the monitoring of the district meter's flow rate while successively closing valves within the DMA, starting with the valve that is farthest away from the meter. A significant reduction in the flow rate is an indication of leakage in the last shut-off section. Step testing has to be performed at night and can be time consuming.

After done step test in selected DMA, the next step is detecting and locating a leak is to listen for the noise of the water being released from the pipe under pressure. The effectiveness of this activity is dependent on the system pressure, the size and shape of the leak and the pipe material. For ensuring accuracy the utility has a wealth of acoustic equipment to pinpoint leaks and bursts which is ground microphone. The technique involves placing the microphone on the ground at intervals along the line of the pipe and noting changes in sound amplification as the microphone nears the leak position. When the ground microphone detects a leak, the operator should mark the area on the surface to locate the leak. The length of time a leak is allowed to run affects the volume of physical losses, so repairs should be completed as soon as possible once a leak is detected. Repair quality also has an effect on whether the repair is sustained.

RESULT AND DISCUSSION

Step testing on DMA Tlogomas 1E are doing by 6 people. Step testing involves the monitoring of the DMA Tlogomas 1E meter's flow rate while successively closing valves within the DMA, starting with the valve 1 that is farthest away from the meter. The result of step test with valve scenario in DMA Tlogomas 1E is described on table 1.

Table 1. Valve Scenario of Step test on DMA Tlogomas 1E

STEP	V 1	V 2	V 3	V 4	V 5	V 6	V 7	V 8	V 9	Pipe Section	Time	Pres sure	Q (L/s)	Water Loss (L/dtk)	dHC	dQ/dHC	Classified of Leakage
START	O	O	O	O	O	O	O	C	C		22;30	1,6	3,99				
STEP 1	C	O	O	O	O	O	O	C	C	1	22;35	1,6	3,57	0,422	10	0,0422	High
STEP 2	C	C	O	O	O	O	O	C	C	2	22;45	1,6	3,40	0,171	25	0,0068	Middle
STEP 3	C	C	C	O	O	O	O	C	C	3	23;00	1,6	3,35	0,050	15	0,0033	Low
STEP 4	C	C	C	C	O	O	O	C	C	4	23;15	1,6	1,90	1,451	11	0,1319	High
STEP 5	C	C	C	C	C	O	O	C	C	5	23;25	1,6	1,35	0,547	11	0,0497	High
STEP 6	C	C	C	C	C	C	O	C	C	6	23;35	1,6	1,13	0,222	9	0,0247	High
STEP 7	C	C	C	C	C	C	C	C	C	7	23;40	1,6	0,00	1,130	25	0,0452	High
INLET	C	C	C	C	C	C	C	C	C	inlet	23;55	1,6	0,00	0,000	4	0,0000	Low
FINISH	O	O	O	O	O	O	O	O	O					3,993	110		

Table 1 shows that total of water losses in DMA Tlogomas 1E is 3,993 l/s. The pipe sections that indicate lots of leakages are section 1, section 4, section 5, section 6, and section 7. Step test scenario on DMA TLogomas 1E can be shown on Figure 1.

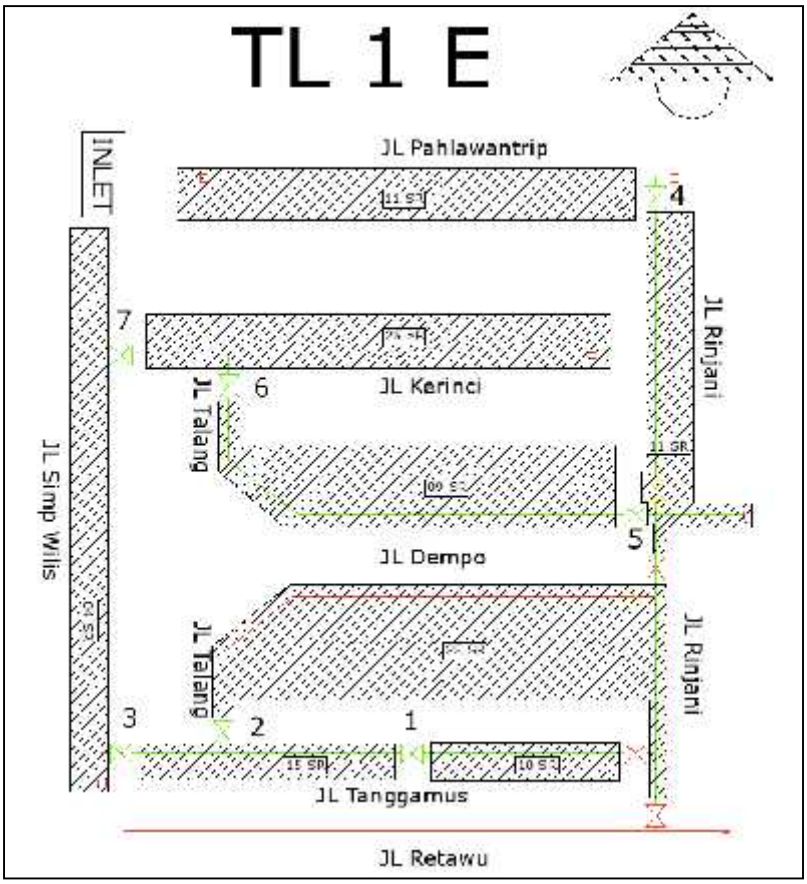

Figure 1 Step Test Scenario on DMA Tlogomas 1E

The next step after gets leakage data from step test is detecting and locating leakages using ground microphone. The most traditional and basic method is to have a

team of leak detection specialists who check all pipes on a regular basis. Since leak noise can be detected, this work is done with a wide range of listening devices, ranging from simple mechanical listening sticks to electronic ground microphones. Any leak in a pressurized water pipe will generate noise. The magnitude and frequency of the noise will depend on a number of factors including the shape and size of the leak, the pipe material and the pressure inside the pipe. Ground microphone pinpoints the location. Leakage inspectors use this equipment to listen the network and identify problems. Much like doctors use stethoscopes. So the result is found leakage in section 4 and section 7, which is in distribution pipes (Figure 2).

Figure 2. Leakage in Section 4 and Section 7

After leakages were located and repaired, calculation of water balance can be done. Non-Revenue Water (NRW) is the difference between System Input Volume and Billed Authorized Consumption. NRW consists of Unbilled Authorized Consumption (usually a minor component of the water balance) and Water Losses (Table 2)

Table 2. Water Balance DMA Tlogomas 1E

No.	Month	Service DMA	Dia-meter mm	Q Inlet m^3	Billing m^3	Customer	NRW		MNF l/s
							m3	%	
1	May	TL 1E	100	9.388	4.641	114	4.747	51	2,33
2	August	TL 1E	100	9.439	5.275	114	4.164	44	2,50

In May 2016 the Non-Revenue Water in DMA Tlogomas 1E is 51%. After leakages are repaired, the Non-Revenue Water becomes 44%. Based on the results, The Minimum Night Flow still high. It because there was a pipe section that need fully repaired. The difference between Non-Revenue Water in DMA Tlogomas 1E on May and August is 13,7%, if step test in DMA Tlogomas Malang can be adapted to the whole DMA of Malang city, thereby Non Revenue Water in PDAM Malang reduced to 17%. It still needs more reparation and maintenance, also management pressure to help reduce the water loss. If PDAM Malang can commit to do leakage control Program and duplicate to another

DMA in Malang, they can save the water more effectively and the target within 5 years can be done.

CONCLUSION

Leaks waste both money and a precious natural resource, and they create a public health risk. The risk to public health can be caused by contaminants entering the pipe through leak opening if water pressure in the distribution system is lost. The step test method is one of method that can adapt to locate the leakages. Successful location of leaks for the case studies presented has demonstrated that the system can be successfully adapted to detect leaks in another DMA. With using step test method in DMA TLogomas 1E, leakages can be located, repaired, and the Non-Revenue Water in DMA Tlogomas 1E reduced to 13,7%. Based on the result, if step test in DMA Tlogomas Malang can be adapted to the whole DMA of malang city, so the Non Revenue Water in PDAM Malang reduced to 17%. But it still needs more reparation and maintenance, also management of pressure to help reduce Non-Revenue Water.

ACKNOWLEDGEMENTS

This study is about evaluation of Non-Revenue Water using step test method in Malang City. Special thanks to Water Supply Company of Malang city (PDAM Malang City) for the help, giving so much information and detailed comments.

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ANALYSIS OF FACTOR FOR DEVELOPING OF MATERIAL RECOVERY FACILITY (MRF) IN SIDOARJO USING DELPHI ANALYSIS

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ABSTRACT
Goverment of Sidoarjo will launch the program called Sidoarjo Zero Waste in 2018. Which is one of the regular activities is the development of material recovery facility (MRF). Seventy-five (75) MRF units have been built and 54% not operated. The aim of this study is to determine the causes of operational material recovery facility (MRF). This study is qualitative research using Delphi analysis with respondents from DKP Sidoarjo, non goverment group, society figure, environmentalists and lecture. This research is expected to provide input to the goverment of Sidoarjo in order to improve performance management material recovery facility (MRF) to maximize incentives factor and correct the resistor factor. The result showed the incentives factor are the availability of land, financing of investment and operational capabilities, the willingness of society, waste management regulations, the number of personel/human resources, commitment from goverment of Sidoarjo and direction of regional development of the area. While the factor resistor the material recovery facility (MRF) operations in Sidoarjo are small area of material recovery facility (MRF), inadequate infrastructure, waste transportation schedule is not routine, limited DKP funds, the reduction of material recovery facility (MRF) allocation funds from the village or limited non goverment group funds, no labor of waste processing, customs and culture of the people, the lack of support for the village government. Based on this result of research several method to enhance the operation of MRF in Sidoarjo county.

Keywords: Delphi, Incentive, material recovery facility (MRF), Resistor

INTRODUCTION

The growth of population will affect the amount of waste generated by the community. The volume of waste generated by residents of Sidoarjo 287.67 m^3 / day (Minarwati, 2014). This waste generation will continue to grow if there is no proper program in waste reduction at the source. The Government of Sidoarjo launched a program Sidoarjo Zero Waste 2018 with many program,one of them is MRF development. MRF development is a program that is suistanable development starting in 2009-2015 which have built 75 MRF with details 26 MRF active and 49 MRF inactive (DKP Kab . Sidoarjo, 2015).

Based on observation, only 7 units of MRF operated well, about 28 of MRF turned into transfer stations and in-active MRF about 40 units. MRF are not functioning optimally, it cause by unpleasant odors and flies due to the emergence of a pile of rubbish around the site is no longer well managed MRF (Bafadal, 2011).

Total inactive MRF are more than 54% it will cause problems either directly or indirectly to the community and affect the performance of DKP as an official who has the authority in waste management. Therefor to determine the performance improvement strategy MRF required mapping of the factors incentives and resistor operation MRF order right on target.

METHOD

This study is using delphi method. Delphi analysis technique is an attempt to obtain a consensus group that is sustainable in order to obtain the agreement of opinion. (Supriharjo, et al,2013). The stages of analysis Delphi as follows:

1. Specifications problems / issues
2. Selecting respondents
3. Make the questionnaire
4. Analysis of the results of the first round
5. Development of subsequent questionnaires

This study is to determine the factors incentives and resistor MRF operational approach various laws and previous studies on waste management as in table 1 below:

Tabel 1 Factors affecting Waste Management

No	Factors	Reference				
		1	2	3	4	5
Technical						
a.	The existence and capacity MRF	√		√	√	√
b.	Distance MRF to settlements				√	
c.	Occupational Health and Safety					√
Financing						
a.	The ability of investment financing, operation and maintenance	√	√	√	√	√
b.	Policy levy / contribution		√	√	√	√
Human resources						
a.	Number of personnel		√		√	√
b.	The quality of human resources	√		√	√	√
Management						
a.	Authority and the principal task of the function Organizations	√	√	√	√	√
b.	Exsistence of standart operasional procedure	√			√	√
c.	Exsistence of the organization's Vision and Mission					√
Community participation						
a.	Customs and culture of society	√	√		√	√
b.	The willingness of society	√		√	√	√
Government						
a.	Regulations on waste management	√			√	
b.	Government's commitment	√	√	√	√	√
c.	Direction of area development	√		√	√	√

Reference 1 : Constitution of republic indonesia number 18 of 2008 about waste management

Reference 2 : SNI 19-2454-2002 Ordinance of operational urban waste management techniques

Reference 3 : SNI 19-3247-1994 about waste management Ordinance in Settlement

Reference 4 : PU Ministerial Regulation No. 3 of 2003 About the Organization of infrastructures and means of persampahan household garbage in the handling and similar household garbage.

Reference 5 : Sultan (2001) *improved performance management Strategy persampahan dipesisir neighborhood lembang Regency, bantaeng*:thesis

Incentives Operational MRF

The incentives factor for operational MRF obtained from interviews three times with iterations one until two times to get a consensus in defining the operational factors incentives of MRF. The result from first interview describes on Table 2.

Tabel 2 Recapitulation of responden's answer

No	Aspect	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12
Technical													
1.	Occupational Health and Safety	DA	DA	A	DA	S	DA	DA	DA	A	A	DA	DA
2.	Availability of land	-	-	-	-	-	-	A	-	-	-	-	-
Financing													
3.	The ability of investment financing, operation and maintenance	DA	DA	A	A	A	A	A	DA	A	A	A	A
Human resources													
4.	Number of personnel	A	A	DA	A	A	A	A	A	A	A	A	A
Manajemen													
5.	Authority and the principal task of the function Organizations	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	A
6.	The existence of the organization's Vision and Mission	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	A
Community participation													
7.	The willingness of society	-	-	-	A	-	-	-	-	-	-	-	-
Government													
8.	Regulations of waste management	A	DA	DA	DA	A	DA	A	A	A	A	A	A
9.	Government's commitment	A	A	A	A	A	DA	A	A	A	A	A	A
10.	Direction of area development	A	A	A	A	A	A	A	A	A	A	A	A

Information:

: Require iteration

: Not require iteration

A : Agree
DA : Disagree
R1 : Respondent from DKP
R2 : Respondent from non govermental group of kraton village
R3 : Respondent from society figure of kepatihan village
R4 : Respondent from Non Goverment Organisation BEST
R5 : Respondent from society figure of suruh village
R6 : Respondent from non govermental group of tebel village
R7 : Respondent from society figure of damarsi village
R8 : Respondent from non govermental group of ngaban village
R9 : Respondent from society figure of gelam village

R10 : Respondent from society figure of jimbaran kulon village
R11 : Respondent from society figure of banjar bendo village
R12 : Respondent from lecturer of UNIPA

Table 2 shows from 10 variables there are nine variables that require iteration to the respondent due to the dissent of respondents one and another. The variables that become the additional of respondents is the availability of land and willing of society. For variable direction of area development by respondents into one of the incentives factors in the operation of MRF so it does not require iteration. While the results of the iteration to the respondents as follows:

1. Occupational health and safety
   After the first iteration, the respondent turn answers into disagree with the consideration that the Occupational health and safety is necessary but without occupational safety and health does'n mean MRF can't operation.
2. Availability of land
   Only one of the respondent from NGO BEST who answered disagree because the availability of land if in the village is still a lot but neither if in the City. Because NGO BEST answered disagree so need iteration for the second time and respondents agree to the terms of land availability is more prevalent in the village compared to the city.
3. Ability investment financing, operation and maintenance.
   The results of the first iteration of respondents on average change answers to agree but the grounds are capable but with limited funds.
4. Number of personnel
   After the first iteration of respondents, they agreed with the reasons for the number of personnel only 4-5 people is an incentives force for employees including officers MRF don't waste hauler.
5. The willingness of society
   The variable written by the respondents of NGO BEST which according to the respondents is that average people would do MRF development, it evidenced by the public want to allocate their land to build MRF village. After iterations to respondents all agreed.
6. Regulations on waste management
   The results of the first iteration of respondents who disagreed to change the answers to agree with an average local regulation reason is supposed to be a rule that must be obeyed by the people but by this local regulation records should be revised and included in detail about MRF.
7. Sidoarjo goverment's commitmen
   The results stated that the first iteration of respondents still do not agree, then do the second iteration and the respondents agree with the reasons that village's goverment commitment did exist but must be accompanied by concrete actions.

Resistor Factors Operational MRF

Resistor factors for operational MRF obtained from interviews three times with iterations one until two times to get a consensus in determining the operational MRF resistor factor. The answer from respondents in a first interview as follows:

Table 3 Recapitulation of responden's answer

No	Aspect	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12
Technical													
1.	Location of MRF	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA
2.	Distance of MRF to settlement	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA
3.	Dimensions of MRF	A	A	A	A	DA	A	DA	DA	DA	DA	A	DA
4.	Unoptimal Infrastructure / inadequate	-	-	-	-	A	-	A	-	A	-	A	-
5.	Unschedule Waste transportation	-	A	-	-	-	A	-	-	-	-	-	-
Financing													
6.	Policy dues	DA	A	DA	DA	DA	DA	DA	DA	DA	DA	A	DA
7.	Limited funds from DKP	A	-	-	-	-	-	-	-	-	-	-	-
8.	Reduced allocation of funds MRF Village / KSM Limited funds.	-	A	-	-	-	-	-	A	A	-	-	-
9.	expensive and different waste transport fee	-	-	-	A	-	A	-	A	-	-	-	-
Human resources													
10.	The quality of human resources	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA
11.	Training from DKP	-	-	A	-	-	-	-	-	-	A	-	-
12.	No labor waste processing	-	-	-	A	-	-	-	-	-	-	-	-
Management													
13	Exsistence of standart operasional procedure	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA
community participation													
14.	Habits and culture of society	A	A	A	A	A	DA	A	A	A	A	A	A
15.	Willingness of society	DA	A	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA
Government													
16.	Lack of support from goverment's village	-	-	-	-	-	-	-	A	-	-	-	-

Based on table 3 there are 16 variables were asked to the respondents, from 16 variables, 4 variables doesn't require iteration and removed from the operational MRF resistor factor because all respondents disagree. Variables that require iteration is as follows:

1. Dimensions of MRF
   The results of the first iteration are 9 respondents agreed and 3 respondents disagreed so the variabel need second iteration. In the second iteration asked back to respondents from society figure of Damarsi, non goverment group of Ngaban and lecture are obtained the answer are agree on the grounds look overall at Sidoarjo not only in the village Damarsi and Ngaban.
2. Infrastructure does not yet support / inadequate
   The variable are obtained the opinion from society figure of Suruh, Damarsi and Gelam. Then carried iteration to 7 other respondents and all respondents answered is agree.
3. Unschedule Waste transportation
   The variables are opinion from non goverment group of kraton dan tebel village. The result are 10 respondents agree and 2 respondents disagree. From second iteration of

respondents agreed and the reason because of DKP doesn't have a solution for dealing with residual waste.

4. Policy dues
   There were 2 respondents who agree and the researcher try to ensure the answer by questioning them again, and then they change their mind by answer that they disagree about the policy. Because there is have consensus disagree of all respondents so this variable removed from factor.
5. limited funds of DKP
   After the first iteration, 11 respondents agree, only one respondent disagree that the limitations of these funds is not an resistor factor of MRF, so it needs second iteration and respondents from the NGO BEST answered agree with the reasons that the limited funds fact that due to budget cuts still acceptable.
6. Reduced allocation of funds for MRF / non govermental group Limited funds.
   The result from iterations, all respondent agreed that the allocation of funds is reduced are one of the resistor factors in the operations MRF.
7. Expensive and different waste transport fee
   The result are all respondents agreed through one iteration that this variable is an resistor factor.
8. Training from DKP
   Based iterations performed to the other respondents showed only one respondent from DKP who disagrees in the first iteration. Then do a second iteration to ask back to the respondent and the respondent answered agree but the reason that training for 2-3 month in MRF is not yet, but the training done by non govermental group.
9. Labor waste processing yet
   Based on the opinion from NGO BEST need iterations to 11 respondents and showed that all agreed.
10. Habits and culture of society
    There is one respondent who disagreed derived from non govermental group from tebel. Based on the results of the first iteration showed that the respondents agree on the condition that applies to the entire territory in Sidoarjo who still have land or yard.
11. Willingness of society
    After the first iteration of respponden from non goverment group of kraton disagreed by the reasons people want but sometimes constrained by the amount of dues.
12. Lack of support from goverment's village
    Based on the proposed variables do the first iteration with the results of all respondents agree with this variable as one of the resistor factors in the operations MRF.

CONCLUSION

Based on the results of iterations that have been made to the respondent showed that the factors that are incentives the operational MRF is the availability of land, ability to finance investment and operations and maintenance, amount of personnel, willingness of society, regulation on waste management, goverment of sidoarjo commitment and directions for regional development. While the factors resistor the operational MRF in Sidoarjo is spacious MRF small, unsupported infrastructure/inadequate, the waste transport is unscheduled, limited funds DKP, the reduced allocation of MRF funds from Rural / Limited funds, no labor for sewage treatment, customs and culture of the people, the lack of support of the village government.

ACKNOWLEDGEMENS

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EVALUATION OF SANITARY INFRASTUCTURE MANAGEMENT AND SERVICE OF SIMPLE APARTMENT RENT FOR LOW INCOME PEOPLE IN SURABAYA

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ABSTRACT
In addition to providing decent housing for Low-Income Communities (MBR), the main function is to improve the quality of the construction rental public housing neighborhoods. Based on observations obtained by the fact that the author rusunawa in Surabaya internally showed a trend toward a decrease in the quality of sanitation services. The main problem that occurs is a wastewater treatment system that is not optimal and inadequate infrastructure resulting in environmental pollution. The purpose of the study was to evaluate whether rusunawa that has been provided in Surabaya already functioning optimally from the standpoint of sanitation. Primary data were collected through observation, documentation, and interviews/ focus group with managers and occupants rusunawa. Purposive sampling method used for sampling. Sampling of wastewater influent and effluent to be studied in the laboratory. Secondary data include the number of occupants, as built drawings, and documents related to the research. Data analysis technique used is descriptive analysis method and interactive analysis. The results showed that the existing sanitation infrastructure is not functioning optimally. Grey water directly discharged into the drainage channel. Maintenance and inspection of the condition has not done routinely. Laboratory test results showed wastewater effluent does not meet the quality standards of domestic waste water. Management of sanitary infrastructure rusunawa that can be applied to optimize waste water infrastructure, among others, the processing of gray water, the operation of wastewater treatment technologies existing right and do emptying septic tanks periodically that waste water discharged into the channel environment meets the quality standards of domestic waste water.

Keywords : evaluation, waste water infrastructure, simple apartment rent (Rusunawa)

INTRODUCTION

According to the Law of the Republic of Indonesia No. 20 of 2011 on the Flats, construction rental public housing is one of the government's efforts to eradicate slums. In addition to providing decent housing for Low-Income Communities (MBR), the main function is to improve the quality of the construction rental public housing neighborhoods. But in its development rusunawa experiencing various problems, one of which is the problem of sanitation in rusunawa. Based on the observation of the author within the last 1 year, obtained by the fact that rusunawa in Surabaya internally showed a trend toward a decrease in the quality of sanitation services. So that sanitation services in rusunawa no effect and a good benefit to the occupants, they can interfere with the health of occupants rusunawa. The main problem that occurs is a wastewater treatment system that is not optimal and inadequate infrastructure resulting in environmental pollution.

The purpose of the study was to evaluate whether the subsidized apartment buildings that have been provided in Surabaya well managed by the government of Surabaya and

East Java Provincial Government is functioning optimally from the standpoint of sanitation. The benefits of this research is that it can recommend the sanitation infrastructure management system that more optimally by promoting the participation of the inhabitants rusunawa so grow a sense of comfort, a sense of belonging, and a sense of responsibility in protecting and maintaining sanitation infrastructure. The other benefit is that it can be on the development and construction of subsidized apartments in Surabaya future.

RESEARCH METHODOLOGY

Rusunawa studied is rusunawa which has been operating in the city of Surabaya and taken one sample for each region, namely :

1. Rusunawa Sombo - Surabaya Center (managed by the Government of Surabaya);
2. Rusunawa Pesapen - North Surabaya (managed by the Government of Surabaya);
3. Rusunawa Tanah Merah I - North Surabaya (managed by the Government of Surabaya);
4. Rusunawa Penjaringansari I - Surabaya East (managed by the Government of Surabaya);
5. Rusunawa Gunungsari - South Surabaya (managed by the Provincial Government of East Java);
6. Rusunawa Romokalisari I - Surabaya West (managed by the Government of Surabaya).

Judging from the amount assessed rusunawa can illustrate more in line with reality, especially for the development and construction of subsidized apartments in Surabaya future.

The research took place in accordance with the systematics presented in Figure 1.

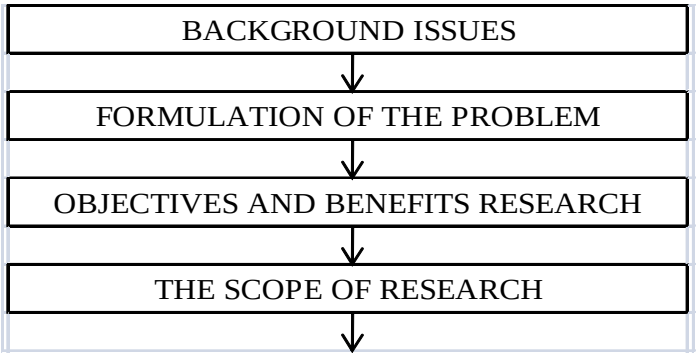
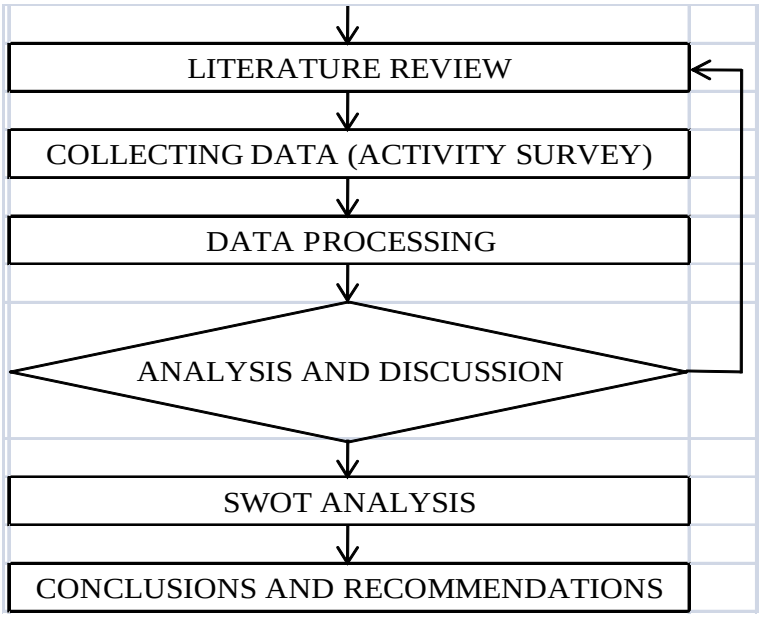


Figure 1. Flowchart Research Framework



Continued Figure 1. Flowchart Research Framework

The collection, processing and data analysis Field Wastewater done as a flowchart in Figure 2.

Primary Data Collection - Secondary		Processing & Analysis	Recommendation
Primary	Secondary		**Quality and adequate capacity :** remain to be done advanced processing and do periodic maintenance **Quality and adequate capacity:** done processing advanced and do periodic maintenance
1. Sampling waste water influent and effluent, sampling do 2 times. **2.** Collecting waste water infrastructure existing conditions.	**1.** The number of people occupant towers **2.** As Built drawings **3.** The number of debit usage of water/PDAM	Check the existing capacity and calculate the real needs of the wastewater treatment infrastructure rusunawa	

Figure 2. Flowchart Collection, Processing and Data Analysis Field Wastewater

RESULTS AND DISCUSSION OF WASTEWATER

A. Completeness and Sanitation Infrastructure Condition Rusunawa Waste Water Sector

Matrix analysis results completeness Rusunawa Infrastructure Sanitation Wastewater Sector are presented in Table 1 and matrix analysis results Facility management conditions Rusunawa Sanitation Wastewater Sector are presented in Table 2.

Table 1. Analysis of Infrastructure Sanitary Fittings Rusunawa Waste Water Sector

No.	REFERENCE	STANDARD	EXISTING
1.	SNI 03-1733-2004 about Tata Cara Perencanaan Lingkungan di Perkotaan	• The distance to the septic tank clean water sources > 10 > 10 m, distance to the building> 1.5 m • There are areas of infiltration and wastewater piping network	**Flats built in < 2000** • The distance to the septic tank water reservoir below 0 m (coincide). • Distance to the septic tank to the building <1.5 m • Distance cesspool into wells <10 m • Not having a leach field, directly channeled into drainage channels • There wastewater piping network
2.	Permen PU No. 60/PRT/1992 about Persyaratan Teknis Pembangunan Rumah Susun.	• Gray water channels include air pipes and manholes are connected to sewerage enviro environment.	• Gray water pipelines are equipped with air pipes • Disposal of gray water does not include manholes, directly discharged into drainage channels.
		• Sewerage closed must be used for all types of sewerage inside buildings or on towers.	• Blackwater disposal in the form of a closed channel up to the septic tank. • Disposal of gray water in the form of a closed channel before getting into the drainage towers in the form of an open channel.
		• Sewerage placed in a room or a special track, must be equipped with a filter junk	• There is a special room for the waste water pipe. • No junk filter / strainer fat.
		• Sewerage lowest floor must separate sewerage toward environmental / septic tank.	• Wastewater disposal lowest floor had its own toward the neighborhood sewer/septic tank
		• Sewerage landscape must have sufficient slope, equipped with holes examiner at each change of direction and a straight line at least every 50 m.	• The slope of the pipe is sufficient. • Drainage channels as yet equipped sewerage manholes.

Source : Results Analysis (2016)

Table 2. Analysis of Infrastructure Management Condition Rusunawa Sanitation Wastewater Sector

No	Judging Elements	Existing Condition	Issues	Alternative Treatment
1	Waste water piping network	• For subsidized apartments built before 2000, the condition of the pipe distribution is unfavorable because many fillings. Although smoothly but there are seepage in some places	• Former patches of gray water pipe seepage.	• Routine maintenance of the pipeline network in the form of leaks and flushing sediment control • Sewerage pipe replacement
2	Septic tank	• Septic tank Condition good enough yet for subsidized apartments built before 2000 do not have a leach field. • In subsidized apartments built after 2000 are already using ABR technology, but less to operate properly for the facility aerator / mixer in the tank ABR often not turned on	• Never happen black water seeping into underground water reservoirs and pollute water / drinking towers. • Due to a lack of control and the periodic draining so often caught overflowing septic tanks. • The water coming out of the tank ABR still does not meet quality standards of domestic waste water.	• Keep conducted laboratory tests on water quality / drinking in the towers. • Necessary repairs to walls and floors from leaking septic tanks. • Built leach field for the towers that do not yet have. • Need for control and emptying septic tanks regularly. • The machine must be continuous mixer.
3	Channel	• Based on observations, it is generally a good channel conditions. However, in some locations there are puddles, little waste, and sediment is thick enough.	• The drain gray water substandard for their trash and sediment. • *Grey water and black water that goes into the drainage channels do not meet quality standards*.	• Regular maintenance of the channel, in the form of a duct cleaning sediment and trash.

Continued Table 2. Analysis of Infrastructure Management Condition Rusunawa Sanitation Wastewater Sector

No	Judging Elements	Existing Condition	Issues	Alternative Treatment
3	Channel	• Bak controls already exist but have not had a spam filter / fat catcher		• Built tubs existing control junk filter / fat catcher • Do laboratory tests on effluent gray water goes into the drainage channel / environment to determine whether it meets the standard of domestic waste water. • Keep the gray water treatment before discharge into the drainage channel / environment.

Source : Results Analysis (2016)

B. Checks on the Effluent Wastewater Quality

Matrix average laboratory test results of two times the sampling in effluent 6 rusunawa in Surabaya are presented in Table 3. The quality standard of domestic wastewater by East Java Governor Regulation No. 72 Year 2013.

Table 3. Average Laboratory Test Results Sample Effluent Water Grey 6 Rusunawa in Surabaya

No.	Parameter	Unit	Quality Standards	Analysis Results	Information
Rusunawa Sombo – Central Surabaya					
1.	pH	-	6 - 9	6,88	Meet
2.	TSS	mg / L	50	305,00	Does not Meet
3.	COD	mg / L O_2	50	650,00	Does not Meet
4.	BOD	mg / L O_2	30	399,00	Does not Meet
5.	Oils and Fats	mg / L	10	49,00	Does not Meet

Continued Table 3. Average Laboratory Test Results Sample Effluent Water Grey 6 Rusunawa in Surabaya

No.	Parameter	Unit	Quality Standards	Analysis Results	Information
Rusunawa Pesapen – North Surabaya					
1.	pH	-	6 - 9	7,13	Meet
2.	TSS	mg / L	50	132,00	Does not Meet
3.	COD	mg / L O_2	50	375,50	Does not Meet
4.	BOD	mg / L O_2	30	229,00	Does not Meet
5.	Minyak dan Lemak	mg / L	10	29,00	Does not Meet
Rusunawa Tanah Merah I – North Surabaya					
1.	pH	-	6 - 9	7,05	Meet
2.	TSS	mg / L	50	140,00	Does not Meet
3.	COD	mg / L O_2	50	396,00	Does not Meet
4.	BOD	mg / L O_2	30	249,00	Does not Meet
5.	Minyak dan Lemak	mg / L	10	31,00	Does not Meet
Rusunawa Penjaringansari I – East Surabaya					
1.	pH	-	6 - 9	7,00	Meet
2.	TSS	mg / L	50	105,00	Does not Meet
3.	COD	mg / L O_2	50	492,50	Does not Meet
4.	BOD	mg / L O_2	30	301,00	Does not Meet
5.	Minyak dan Lemak	mg / L	10	38,00	Does not Meet
Rusunawa Gunungsari – South Surabaya					
1.	pH	-	6 - 9	7,03	Meet
2.	TSS	mg / L	50	79,00	Does not Meet
3.	COD	mg / L O_2	50	137,50	Does not Meet
4.	BOD	mg / L O_2	30	84,00	Does not Meet
5.	Minyak dan Lemak	mg / L	10	11,00	Does not Meet
Rusunawa Romokalisari – West Surabaya					
1.	pH	-	6 - 9	7,05	Meet
2.	TSS	mg / L	50	138,00	Does not Meet
3.	COD	mg / L O_2	50	517,50	Does not Meet
4.	BOD	mg / L O_2	30	315,00	Does not Meet
5.	Minyak dan Lemak	mg / L	10	40,00	Does not Meet

Source : Environmental Quality Laboratory ITS (2016)

CONCLUSIONS AND RECOMMENDATIONS

From the research that has been done it can be concluded as follows :

1. Regular maintenance of the piping network such as leakage control, sediment flushing and replacing the damaged pipe / unfit for use;
2. Need for control and emptying septic tanks regularly, necessary repairs to the walls and floors from leaking septic tanks, leach fields built for towers that do not have the necessary laboratory tests on the quality of water / drink in the towers, and operate technology proper waste water treatment;

3. Built like controls that are strainer trash / fat catcher, the need for gray water treatment before discharge into the drainage channel / environment, and conducted laboratory tests on effluent gray water goes into the drainage channel / environment to determine whether it meets the standard wastewater domestic.

The proposed recommendation to improve the results of this research:

1. Undertake further studies on the detail design of waste water treatment plant according to the results of this research analysis.

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EVALUATION OF NON-REVENUE WATER USING WATER BALANCE METHOD AT WATER SUPPLY COMPANY (PDAM) MOJOKERTO CITY

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ABSTRACT
Water supply company (PDAM) in Mojokerto city is experiencing a crisis in water supply services. The supply has not matched the number of consumers. The percentage of non – revenue water (NRW) in the 1st half of 2016 reached 52,47%. The high percentage of non-revenue water negatively impacts various activities such as service hours are no longer 24 hours, the quantity and quality of water distributed are below average of a good standard, and the number of customers is stagnant. PDAM Mojokerto has to improve a reduction in water loss. The aim of this research was to evaluate and divide the components of non-revenue water by making water balance. Making the water balance is conducted by incorporating multiple types of data on production, distribution and billing collection. The results of the research were that the largest percentage of non-revenue water is physical losses and inaccurate meter readings. The high number of physical losses due to pipe leakage, bad connection, and faulty customer meters.

Keywords: Non-Revenue Water,Water Balance, Water Supply

INTRODUCTION

Water supply systems serve only 21.21% of the entire population. Mojokerto city only has one production unit that is water treatment plant (IPA) Wates. IPA Wates treat water from Brantas River with total capacity 110 l/sec. The piping network has spread over most of the town using pump for the distribution system.

Mojokerto city had a water supply management crisis. Major challenges facing water utilities is the high level of water lost in distribution network. If a large proportion of water that is supplied is lost, meeting consumer demand is much more dificult. The more water requirements the more operational costs, while the water released are not fully sold. Since this water yield no revenue, heavy losses also make it harder to keep water tariffs at a reasonable and affordable level (Frauendorfer and Limberger, 2010).

In 2015, water supply company (PDAM) produce water amounted to 1.930.022 m3 and the amount of water sold is 852.359 m3. With a selling price Rp. 2.420,77 per m3, the amount of water revenue reached Rp. 2.036.357.180,00. Annuall operating cost is 5.366.478.386,90 rupiah, so the price of water cost Rp. 3.475,66 per m3 (PDAM Kota Mojokerto, 2015). From the data above, the selling price amounted to 69.65% of the cost price or lower 30.35% of breakeven point. It can be concluded that PDAM suffered a loss Rp. 1.054,89 per m3. Due to this condition it is advised that PDAM should emphasis on cost efficiency and water lost.

According to the International Water Association (IWA) Task Force on Water Loss, (IWA,2003), Non Revenue Water (NRW), is “the difference between System Input Volume and Billed Authorised Consumption”. The two most important component of of NRW are the real losses and the apparent losses. In the view these components are the ones which need much resource in terms of logistics, staffing and finance in order to control water losses. The third component, unbilled authorised consumption can be controlled

fairly well without much resource. The starting point to deal with NRW is conducting a water balance (Butler and Mamon, 2006). Water Balance are calculated to determine how much water is being lost in disribution system; to accomplish this,a system's water supply and the different components of water consumption during the period under consideration are broken down (Puust et al. 2010).

METHOD

The first step in reducing water losses is develop an understanding of the whole picture of a water system that includes preparation of water balance. To be able to calculate the water balance it is necessary to understand the production and distribution system that are applied in PDAM. It normally has production, transmission, distribution, customer meters, water consumption reading and billing accounts system. The results of the balance are then used to establish performance indicators that allow water losses to be compared, the effects and the decisive causes to be analyzed, and countermeasures to be planned (Farley & Liemberger, 2005)

This study was conducted from January to June 2016. The first stage was to calculate the number of IPA Wates' supply, then input the data as in Figure 1. The next step was to verify the reliability of data in the context of the results. The result of water balance was in the form of weighting each component of NRW. This made PDAM Mojokerto easy in making the NRW reduction program.

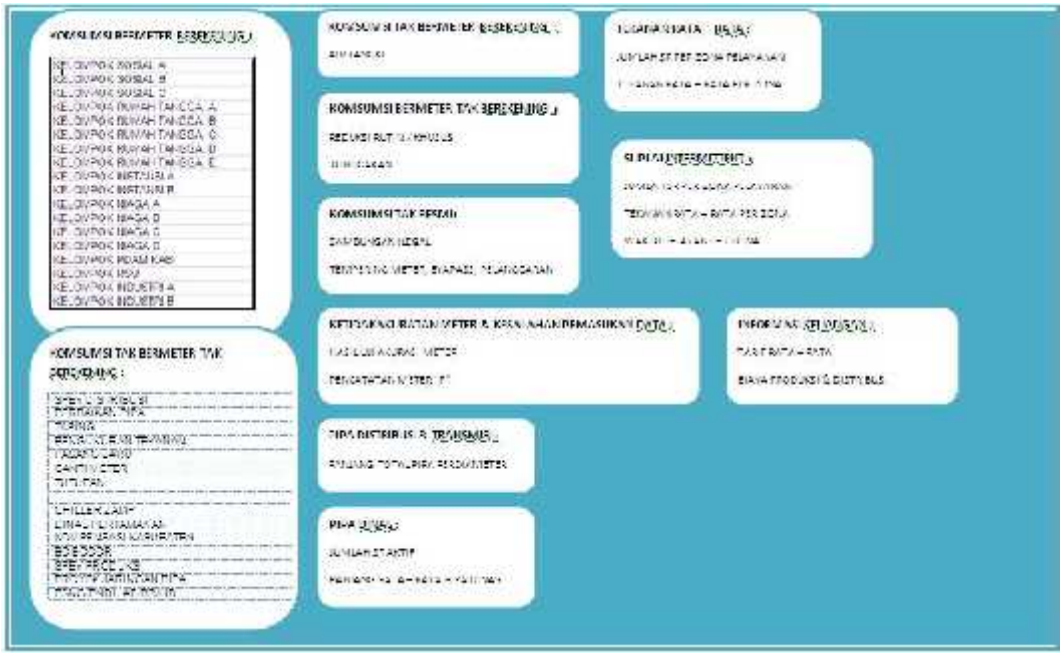

Figure 1: Component Needed in Inputing Data

RESULT AND DISCUSSION

Measurement result of the water supply of IPA Wates are: the amount of discharge in January-June amounted to 826.537 m3. This number is used as an input of annual system volume. IPA Wates use electromagnetic flow meter, the estimated range accuracy of 0.2%.

The second step is to measure authorized consumption. authorized consumption divided on billed metered consumption, billed unmetered consumption, unbilled metered consumption and unbilled unmetered consumption. billed metered consumption and billed unmetered consumption are available in bills department or subscription department. The

correlation between meter reading, billing and water balance period need to be consider. unbilled metered consumption there are component legimate but not billead and not produce revenue.this is equal to unbilled metered consumption plus unbilled unmetered consumption. Usually the value is insignificant. unbilled unmetered consumption, in this case, are not recorded. Flow assumption of unbilled unmetered consumption could be seen in Figure 2.

Diameter in	Diameter mm	Debit l/dt	m3/jam	m3/menit
½	10	1.72	6	0.10
¾	20	2.51	9	0.15
1	25	2.83	10	0.17
2	50	5.66	20	0.34
3	75	8.49	31	0.51
4	100	11.32	41	0.68
6	150	16.98	61	1.02
8	200	22.64	82	1.36
10 – 16	> 300	33.96	122	2.04
Pasang Alat Tekanan		0.2	1	0.01
BR		5.66	20	0.34
HDR		8.01	29	0.48
BO		2.23	8	0.13
Pasang Baru		0.75	3	0.045

Figure 2 : Flow Assumption

The third step is to estimate the commercial losses. Commercial losess consists of an authorized consumption, metering inaccuracies and data handling errors. These estimations are difficult to be done, often inaccurate. The fourth step is to calculate the physical losses. Physical loss is the loss of the system input until customer’s consumption. After all steps, cross-check the data obtained and the estimation, thus approaching the real calculation. The calculation and the percentage of NRW components PDAM Mojokerto period from January to June 2016 is as follow.

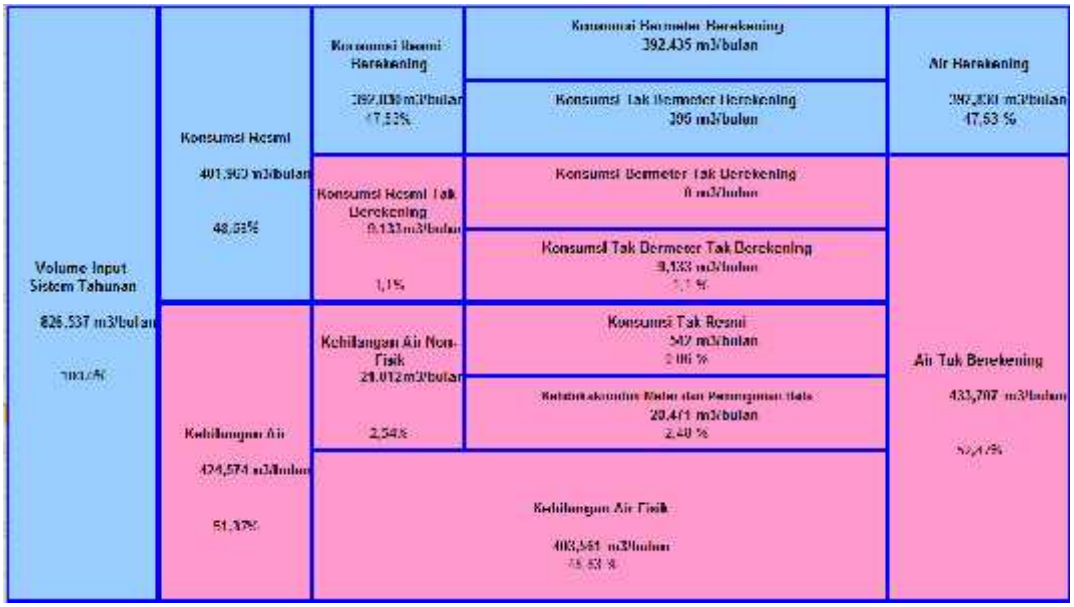

Figure 4 : Water Balance PDAM Kota Mojokerto

Total NRW of PDAM Kota Mojokerto distribution system period January - June 2016 is 52.47%. The largest component is physical water losses. Physical losses are leakage and other physical water losses from the pressurized system and the utility's storage tanks, up to the point of customer use. The high physical water loss is due to pipeline age and condition that has decreased. there are no updated network data make maintenance and operations are based on the needs of customers only, without considering the pipe ability/condition.

CONCLUSION

Mojokerto city had a water supply management crisis. Major challenges facing water utilities is the high level of water lost in distribution network. Since this water yield no revenue, heavy losses also make it harder to keep water tariffs at a reasonable and affordable level. In 2015, Water supply company suffered a loss Rp. 1.054,89 per m3. In the case of intermittent supply, which is frequently caused by excessive leakage, the urban poor often suffer most, as they cannot afford proper storage facilities and pumps and often have to buy water from vendors during non-supply hours.

Total NRW of PDAM Kota Mojokerto distribution system period January - June 2016 is 52.47%. The highest is physical losses up to 48%. The next step for reduce NRW are network review. Reducing physical losses will also make more water available and enable water utilities to increase coverage, including to poor communities.

ACKNOWLEDGMENT

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THE CORRELATION OF ACUTE PESTICIDE EXPOSURE WITH URINARY ARSENIC AT ONION SPRAYER FARMERS IN BREBES

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ABSTRACT
Background: Brebes is one of regencies in Central Java which produces onion. The high production of onion is followed by the high use of pesticides as spraying material in order to eradicate the pest. One of the active ingredients of the pesticide is arsenic, which is a highly toxic metal to humans. The pesticide exposures can cause poisoning and negative impacts on health. Exposure to pesticides can be detected by the presence of urinary arsenic. Therefore, this study aims to determine the correlation of pesticide exposure with urinary arsenic level at spraying onion farmers in Brebes. Methods: This study was an observational study using cross-sectional design. The research subjects were 32 people who are volunteer themself. The variables examined in were urinary arsenic and pesticide exposure factors include: knowledge, behavior, practice, year of work, the pesticide dose, the wind direction, the use of masks, smoking habits, frequency and duration of spraying. Data were collected by interview, observation, and laboratory examination of urine samples. Data were analyzed using correlation test at level of significance 5%. Results: The results showed that average level of urinary arsenic at farmers is 5.12 mg / l. Most respondents didn't know what they should do in case of poisoning. In general, The farmers had relatively good behavior. In reality, they practice in the handling of pesticides and spraying is relatively poor. Statistical analysis showed that there was no correlation between year of work, frequency and duration of work with urinary arsenic level (p-value> 0.05). Conclusion: The study concluded that there is no strong evidence about the factors associated with the urinary arsenic

Keyword: Urinary arsenic, onion farmer, Brebes

INTRODUCTION

Indonesia is an agricultural country with most of its population work as farmers. Data from the Central Bureau of Statistics in August 2010 showed that the number of agricultural workers was recorded at 41.49 million people. The number of sectors making agriculture as the largest contributor to employment in Indonesia with a share of 38.4% of the total working population of 108.2 million people.[1)] Fulfillment of needs for foodstuffs in large quantities is not possible without the addition of pesticides, that the exterminator weeds, fungicides, rodenticides and insecticides. Also the artificial fertilizers must be mentioned in this topic. Although it was in this case does not involve pesticides in the narrow meaning[2)], mostly agriculture and plantations in a professional and large-scale use of organophosphates as pesticides. So that the use of pesticides not to cause health problems, then the user must follow a predetermined dose. But apparently Indonesian agricultural products such as potatoes, cabbage, beans, onions and a variety of vegetables returned after being sent because the pesticide exceeded safe levels set.[3)]

Pesticides or Pest Killing Agent is chemical compounds that are generally toxic, is used to eradicate pests of plants, diseases of plants and weeds. Pesticides are all substances or mixtures of substances that are used to regulate the growth or drying plant.[4)] The use of pesticides is usually done because of the fears of the pests that can reduce their crops. But in fact, now, the use of pesticides not only in the presence of pests, but also at times absolutely

no pests. So the use of pesticides can now be said to be "blanket cover system" that can lead to resistance to pests.[4)]

The entry path of human exposure to pesticides is through the mouth (orally), through respiration (inhalation), and through the skin (dermal).[4)] The negative impact of exposure to pesticides can contaminate workers directly resulting in poisoning. In Indonesia many cases of poisoning among others in Kulon Progo there were 210 cases of poisoning by physical examination and clinical, laboratory examined 50 of them with the results of 15 people (30%) poisoning. In Sleman reported 30 officers pest eradication, 14 (46.66%) experienced symptoms of poisoning.[3)]

One of the parameters the occurrence of acute exposure to pesticides is the concentration of arsenic (As) in the urine. The entry of arsenic in large quantities into the body suddenly causes acute attacks of abdominal pain in the form of flavor is very damaged as a result of the digestive system, vomiting, diarrhea, intense thirst, abdominal cramps, and finally shock, coma, and death. In addition, arsenic also causes physiological disorders, such as gastrointestinal and liver disorders, cardiovascular disorders, neurological disorders, respiratory disorders, and reproductive disorders can even cause carcinogenic effects. Parts of the body that are usually affected are skin and lung. There are two kinds of arsenic exposure on the human body, those are acute exposure and chronic exposure.[5)]

According to Casarett and Doull's (1986), determining the biological indicators of arsenic poisoning is a very important thing. Arsenic has a short half-life time (a few days), so it can be found in the blood only at the time of acute exposure. For chronic exposure of arsenic is not commonly done assessment. To determine the presence of arsenic in the body, it is necessary laboratory examination. There are two kinds of laboratory tests that can be used is by checking levels of arsenic in urine and hair. Arsenic in urine is an indicator of arsenic poisoning is the best for workers exposed by arsenic. Normal levels of arsenic in the urine is less than 50 ug/L.[6)] According to the United States Department of Health and Human Services, the initial clinical diagnosis of arsenic poisoning is often difficult, the key laboratory tests in exposure to arsenic is arsenic excretion in the urine. The best specimens are 24-hour urine, although the urine as it can also help in urgency.[5)] In addition, according to the report Pollution in People, Toxic Chemicals in Washingtonians that the arsenic found in some pesticides and arsenic was found in urine samples at four of the 10 workers in Washingtonians.[7)]

Furthermore, case studies were carried EPA (Environmental Protection Agency) explains that arsenic is organic form (containing carbon), such as monosodium methanearsonate and disodium methanearsonate used in pesticides for agricultural applications. The concentration of arsenic in the urine is an indication of exposure to arsenic were measured within 24 hours after exposure. This was also expressed by the experts that the arsenic concentration in urine is the best indicator of the current poisoning indicator (1-2 days).[8)]

Brebes regency is one of regencies in Central Java, which has a high onion production. The high product of shallots/onion followed by the high use of pesticides by farmers to eradicate the pest. This condition is very risky cause of pesticide poisoning in farmers. Study the impact of pesticides on farmers has often been done with cholinesterase parameter. Besides cholinesterase, there are other biological indicators that can be used to look at the incidence of pesticide poisoning, the content of arsenic in the urine. Research exposure to pesticides with biological indicator which is arsenic in urine has never been done in Brebes. Therefore, this study aims to look at the effects of exposure to pesticides with arsenic levels in the urine of onion farmers in Brebes.

METHODS

This study was an observational study with cross-sectional design. This design studied the dynamics of the correlation between risk factors with effects, with the approach of observation or the collection of data at a time (point time approach). The population of this study were sprayer farmers of onion in Brebes. The sample size are 50 people. Variables examined included doses of pesticides, the number of combinations of pesticides, use of PPE, long workday, the intensity of spraying and spraying action downwind, and arsenic levels in the urine. All data is taken from survey respondents (sprayer farmers of onion in Brebes). Data was collected through interviews and observations. Being the data content of arsenic in urine taken from urine spraying onion farmers by conducting laboratory tests. Data analysis was performed by descriptive and analytic.

RESULTS AND DISCUSSION

The results of the examination of urine arsenic levels at onion sprayer farmers in the district Kersana obtained average 5.1137 mg/l (range 1.40 to 14.45 ug/l). According to the American Conference of Govermental Industrial in 2001, the levels of arsenic in the urine is still below the threshold value. Although the levels of arsenic in the urine is still at a safe level according to these standards, but still requires attention by the parties concerned, such as agriculture and health sectors. This is because regardless of the size of pesticides that enter into the human body will still be injurious, because pesticides are toxic. In addition, exposure to arsenic at low levels for a long time will give harmful health effects, one of which is anemia. This is according to the results of research which stated that anemia is an important determinant of outcome of arsenic exposure. The higher the average levels of arsenic, the lower the Hb.[9]

Pesticides are alternative materials which are used by farmers to kill pests communities of plants (including onion). Based on the existing references, one of the materials used for the production of pesticides is arsenic is a poison that is very dangerous (can kill humans). Therefore, although the levels of arsenic in the urine of farmers still below the safe threshold value, this condition needs attention. Agricultural bureau expected role in order to increase public knowledge of farmers in other to apply pesticides correctly and rationally. This knowledge is important so that farmers can spray to prevent pesticide exposure, so it does not get into the human body. Health Department is also expected to increase the role in farmers' knowledge about the symptoms and dangers of pesticide poisoning. This is important to increase their awareness in order to be able to apply the principles of personal hygiene in the handling of pesticides from preparation through spraying.

Knowledge of safety of using pesticide is essential for farmers spraying. This is because most of them (62.5%) graduated from elementary school only. A person with low education are generally less knowledge of safety and not able to think rationally, so that it can lead to a tendency to use pesticides for spraying according to his own perception. Thus, the party who has the authority to develop the farmers should always improve their knowledge in order to know, understand, have a good attitude in applying pesticides. This advice is important because it is supported by the facts in field that as many as 46.9% of the farmers in the spraying onion applied pesticide dose not comply with the rules on the label. In addition to not see the rules of the dose on the label, most of them (34.4%) use a combination of all four types of pesticides for spraying activities and most are using 7 different combinations of pesticides. Table 1 provides an analysis of the factors of exposure to pesticides with arsenic urine of respondents.

Table 1. Analysis of exposure factors and urinary arsenic at onion spayer farmers in the district of Brebes

Independent Variable	N	Arsenic (µg/l)			
		Average	Std dev	U-test	p-value
1. Did doses used the correct amount?					
Yes	17	5,9047	3,93	99,500	0,290
No	15	4,2173	2,10		
2. Pay attention to the wind direction:					
No	6	4,5667	1,98	73,500	0,828
Yes	26	5,2400	3,52		
3. Wear gloves when mixing pesticides:					
Tidak	27	4,7763	3,04	45,500	0,276
Ya	5	6,9360	4,20		
4. Wear masks when using pesticide:					
No	12	4,4017	2,14	108,00	0,640
Yes	20	5,5410	3,77		
5. Smoking while spraying pesticide:					
Yes	17	5,5188	3,08	101,00	0,317
No	15	4,6547	3,51		
6. Combine pesticide :					
Sufficient (2 variants)	2	4,0000	3,04	24,500	0,668
Excess (more than 2 variants)	30	5,1880	3,32		
7. Spraying frequency in a week:					
Twice					
Three times or more	9	5,8689	4,81	102,500	0,967
	23	4,8183	2,51		

The behavior of spraying farmers also is a concern. This problem is demonstrated by the fact such as not using gloves when dispensing pesticides (84.37%), excessive pesticide combination (93.75%), smoking while spraying (53.12%). Smoking habits also affect the increase in arsenic levels in the urine. Especially in combination with the eating habits of sea fish meal will increase the levels of arsenic in the urine. This is consistent with the results of research said that both smoking and consumption of sea fish provide significant effects on the metabolite of inorganic arsenic (AS^{3+}, AS^{5+}, MMA and DMA).[10]

Increased of knowledge indispensable for farmers spraying. This knowledge will underpin the growth of a good attitude for farmers, which will foster an attitude oriented spraying for good practice. Knowledge about the symptoms, the action in the event of poisoning, mix the right pesticide and spraying were both still very limited. Most respondents (59.4%) have a good knowledge about the symptoms of pesticide poisoning (find out more 2 symptoms). However, when viewed from the knowledge of what they should do in case of poisoning, most of them (87.5%) had knowledge that is mediocre, likewise knowledge about the right mix of pesticides (56.3%).

Another fact that was found in this study is that most (37.5%) respondents have a good attitude. They disagreed that the need to use excessive doses (beyond measure) to increase better results. Another showed a good attitude is to spray the onions should be done when the plants attacked by pests alone. Most respondents (71.9%) agreed when spraying is only done when the plants are attacked by pests. This attitude was necessary to prevent exposure to arsenic decreases in their activities. Nonetheless, other studies have shown that family members are not exposed to arsenic within 24 hours, but have a history of exposure to arsenic

before, they had higher levels of serum arsenic inhibiter higher than that had no previous history.[11]

CONCLUSION

The average of urinary arsenic at onion sprayer farmer is 5.1157 mg/l. Urinary arsenic levels are still far below the threshold value of arsenic poisoning (50 ug/l). The number of combinations of pesticides used by farmers of onion quite a lot with a mean 4 types (a maximum of 7 types). This research has not been able to prove the variable that acts as a risk factor for urinary arsenic at onion sprayer farmers in the district of Kersana, Brebes Regency.

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THE NEW SPESIES *ANOPHELES AITKENI* AS THE THREAT OF MALARIA IN INDONESIA (CASE OF PURWOREJO DISTRICT CENTRAL JAVA PROVINCE INDONESIA)

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ABSTRACT
Background: The Climate change have several impact for live. The rainy and and dry season were affected by climate change. The extreme weather affected of the ecological system including the flora, fauna and human. The dynamics of the vector of malaria caused by the influence of weather changes.Increasing the type and density vector becomes a factor high rates of malaria in Indonesia. Malaria was continuing health problem in Indonesia with API 2014 was 0.99, decrease as 0, 85 (2015). Malaria has been targeted for elimination from Indonesia by 2030. Purworejo district has still of endemic malaria area (2015) with API 1,8 (1.364 case of malaria). Methods :The descriptive analitical reserach with crossectional survey, for analyze of the Anopheles bionomic. The observation going on intermediate season as peak of malaria. Bionomic survey of temperature and vector densities were sampled of 12 villages covering settings available, on 12 hour research, base on Manual on Practical Entomology In Malaria, WHO Division of Malaria and Other Parasitic Diseases, Part I,II for vector identification. Elisa analisys for vector confirmatif test. Results : Anopheles aitkeni was the new discovered species of Anopheles, by the 4 sp/day density. Nine species were found before as : *An.balabacensis; An.aconitus; An.barbirostris; An.vagus; An.anullaris; An.kochi; An.maculatus; An.indifinitus; An.subpictus*. Topographically species Anopheles disperse as 82.35% research area, with their bionomic. Conclusions: The weatherchanges as triggers of an increase of the species Anopheles. The Anopheles aitkenii was identified as the new species, by 4sp/day density, as the vector of transmitting malaria.

Keyword : Weather changes, Anopheles aitkenii, Malaria, Purworejo

INTRODUCTION

The Climate change has several impact for live [1]. The Air temperature increases all regions globally [2]. The emissions of industries have impact on climate change. Naturally there is the phenomenon of La Nina and El Nino influence on the weather [3].The temperature, humidity, rainfall in each region is influenced by both factors.

The rainy and dry season were affected by climate change. The monthly rainfall of season indicates a changing [4]. October - April as a benchmark of change of the seasons has been a chengaed. Purworejodistrict have experienced several years without dry season of 2010 and 2016 (Purworejo, 2016). The changing of the dry season and the rainy season in each region to give effect to the dynamics of species Anopheles [3].

The changes of the weather will have a direct impact on ecological systems, so that the habitat of living [5]. The weather changes will have an impact on the concentration of minerals, water, and energy, in every habitat [6]. The grawthing and development of living is affected by the concentration of mineral, water, and energy. The dynamics of density and species of living things, will occur as a result of climate change in the region [7]

Leibig states there are the limiting factors in each organism. The abundanceof the limiting factor becomes the trigger for organism lives. Organism are in optimum grawthing

condition with similar factor. The specieshave its dynamics as a limiting factor variability. The extreme weather affected of the ecological system Including the flora, fauna and human [8].

The dynamics of the vector of malaria the caused by the influence of weather changes. Increasing the type and density of vector Becomes a factor of high rates of malaria in Indonesia. The spescies of Anopheles in Purworejo ever identified as many as 14. *These species are An. minimus; An.tesselatus, An. flavirostri; An.arbumrosus; An.sundaikus; An. Balabecensis; An.aconitus; An.barbirostres; An.vagus; An.anularis; An.kochi; An.maculatus; An.indifinitus; An.subpictus*[9]. *Overall the unidentified species as a vector. Some species are experiencing the shifting role as a vector. In a study in 2013 found the An.balabacensis, and An.maculatus.*

Malaria was continuing health problem in Indonesia with API in 2014 as 0.99, decrease as 0,85 (2015). Malaria has been targeted for elimination from Indonesia by 2030. Purworejo district still has areas of endemic malaria (2015) with API 1.8 (1,364 cases of malaria). Diversity vectors of malaria in Purworejo, became one of the supporting factors of malaria cases has fluctuated.

METHODS

The population is the villages in the sub district Kaligesing ever a case of malaria in Purworejo, in the period 2010 - 2015. The total population of 21 villages administratively.The analysis unit with 12 village, that composed of several of the population. Each class has region characteristic. Suppose for analysis with Low Case Incidence (LCI) has four members; Middle region Case Incidence (6), while for the area of High Case Incidence (2) .This unit of analysis that produced a region where there is ecological processes and life thereon. The units of analysis as the smallest unit formed have different characteristics and provides support different to the life above. Environmental profile is used to illustrate the characteristics of each unit of land, the dynamics that occur spatially and temporally pattern.

The researchof density of the mosquitoes is done by using the guidelines of the "Manual on Practical Entomology in Malaria, WHO Division of Malaria and Other ParasiticDiseases, Part I.Research density of mosquitoes for each location do at night between 18:00 to 06:00 a clock. The trapping location were indoors (ID), outdoor outdoors (OD), the resting. The arrests IR for 40 minutes, while catching OD, Resting, each performed for 10 minutes. each research group is responsible for one location, each group consisting of two people, and overseen by a supervisor in charge of the direction, supervision and investigation of mosquito species obtained from the arrest[11]

Identification density vector was done: Village Malaria Person (JMD), confirmatory test using the Elisa test to ascertain the role of the species as a vector.The population is a village with malaria cases as much as 21 villages. Overall sample calculation result class number 4, bound Of error at 95% confidence level, is taken as 1, (Nasir, 1983; Lapao, 2012). The formula used to Determine the number of samples is: n = (L Σ Ni2. Σi2) / (N2D + Σ Ni. Σi2), D = B2 / 4, with 95% confidence. The number of samples rounded locations 11.68, or 12 sampling location [12]

The air temperature was measured every hour at each location of the observations from 6 p.m. to 6:00 a.m. by portable thermometer. The type and density of vector arrests every hour, on 12 hours. Research of mosquito density is done by using the guidelines of the "Manual on Practical Entomology In Malaria, WHO Division of Malaria and Other Parasitic Diseases, Part I, II) (WHO, 1995; WHO, 1975). Identification of species Carried in Parasitology Gadjahmada University Laboratory[11]

RESULTS AND DISCUSSION

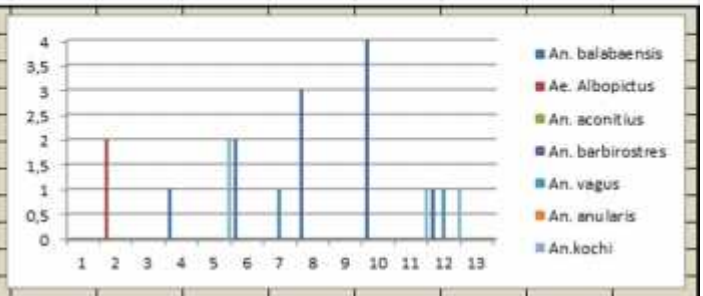
DailyTemperature

The results of research, the temperature at 06:00 pm to 6:00 amhave variety. The maximum air temperature of 27°C while the minimum temperature of 19°C. The average air temperature at night around 24.5°C - 22.7°C. At 06:00 pm the highest temperatures and decreased to the lowest temperature in 05:00 pm. Low air temperature occurs in the hilly region (Sudorogo), until 19°C. The study was conducted in October, usuallyas the dry season. Actually the research is still high rainfall, with 180 mm, as wet season.

The deviation of the temperature 8ºC between low land and the hilly. The topographic factor have the impact of temperature. Temperature as determinant of each area, give the characteristic of ecology. The spescies of Anopheles depend on the temperature of area. The specific area have been spesific species, see Table 1.

Table 1 : Variability of Temperature and spesies of Anopheles hourly

Description		18 -19	19 - 20	20 -21	21 - 22	22 - 23	23-24	24 - 01	01-02	02-03	03-04	04-05	05-06
Temp	°C	24,5	24,2	24,1	23,8	23,5	23,4	23,1	22,8	22,8	22,8	22,8	22,7
	°F	76,1	75,575	75,425	74,75	74,225	74,075	73,625	73,115	72,95	72,95	72,95	72,8
1	35												
2	34												
3	33												
4	32												
5	30												
6	29												
7	28												
8	27												
9	26												
10	25												
11	24												
12	23												
13	22												
14	21												
15	20												
An. balabaensis		0	0	1	0	2	0	3	0	4	0	1	0
Ae. Albopictus		2	0	0	0	0	0	0	0	0	0	0	0
An. aconitius		0	0	0	0	0	0	0	0	0	0	0	0
An. barbirostres		0	0	0	0	0	0	0	0	0	0	0	0
An. vagus		0	0	0	0	0	1	0	0	0	0	1	0
An. anularis		0	0	0	0	0	0	0	0	0	0	0	0
An.kochi		0	0	0	0	0	0	0	0	0	0	0	0
An. maculatus		0	0	0	0	0	0	0	0	0	0	0	0
An.indifinitus		0	0	0	0	0	0	0	0	0	0	0	0
An.subpictus		0	0	0	0	0	0	0	0	0	0	0	0
An.aitkeni		0	0	0	2	0	0	0	0	0	1	1	0
Culex, sp		6	22	11	24	12	5	10	2	16	1	4	0



Spesies of *Anopheles*

There are three (3) spesies of *Anopheles*dispers on 12 locations studi. Allof these species are *An.balabacensis, An.vagus,and An.aitkeni*. Besides the four species are also found Culexand *Aedes Albopictus*species, throughout the night during the arrest. Number of species caught decreased if be compared with previous studies that *An.balabacensis; An.aconitus; An.barbirostris; An.vagus; An.anullaris; An.kochi; An.maculatus; An.indifinitus; An.subpictus*.

The species of *An.balabacensis*present at almost all the night, with a peak density at 02:00 a.m to 03:00 a.m. The presence of these species in the late hours gives an indication that breedingplace, so far from the bittingarea in the residence. *An.vagus* species was found at midnight (11:00 to 03:00 a.m), giving an indication that thebreedingplace nearfrom bitting area. Other species found are *An.aitkeni*, was found at night until 05.00 a.m.

Spesies *Anopheles aitkeni*

The new species was found *Anophelesaitkeni*. This spesies was found at 21:00 pm to 10:00 p.m. The second periode was 2:00 a.m. to 04:00 am. The total of species 4 mosquito during traping periode. The spesies of *Anopheles aitkenii* have the specific identifiying mark, as follows : 1. No grye bullet of wings; 2. The same long size palpus and probocis; 3. The turtle sel of the head very closed; 4. Dark of the abdomen; 5. The surface of the prescutellumWitout hair.The individuals of the species along the arrests.

This species was found in the Ngadirejo Village, sub district Kaligesing , located at coordinates 07°40"0 'latitude and 110 ° 0644"8' E, at a height of 326 msee level. Habitat is located on the plantation, agricultural wetlands, forests, fields, topographically form categories mountains, hills or plains. Breeding a major place in the form of rivers, which flow is not continuous, and springs. Resting in the form of the yard is overgrown vegetation population in the form of dense trees, overgrown vegetation in the form of rubber and oil major.

DISCUSSION

The *Aitkeniiof Anopheles* were not found during the observation 2010-2015. This species was group of STETHOMYIA, with variants insulaeflorum and papuae. W Taken [20]. Anopheles aitkeni was found by James, 1993, in Karwar Bombay, India, near the caves. These species were found in Java, Sumatra, Kalimantan and Sulawesi, does not act as vector [bonne wepster&Swellengrebel, 1953 and Knight & Stone, 1997) [21]. The previous study (2010) in Purworejowas found 14 species. Those species are *An.minimus; An.tesselatus; An.flavirostri; An.arbumrosus; An.sundaikus; An. Balabecensis; An.aconitus; An.barbirostres; An.vagus; An.anularis; An.kochi; An.maculatus; An.indifinitus; An.subpictus*. [10].The continuing research in 2014 found the nine of species : *An.balabacensis; An.aconitus; An.barbirostres; An.vagus; An.anularis; An.kochi; An.maculatus; An.indifinitus; An.subpictus* [9]. *Anopheles aitkenii* (James, 1903).SwellengrebelSwellengrebel&-de Graaf (1919a) [21]classify *An. aitkenii* as a typical 'hill-species', they found the species in low hills up to 1500 m. Russell et al. (1946) denote An. aitkenii as an upland form, Boyd (1949) as a typical jungle form. In 1921, 1932 and 1953 the descriptions of the breeding places Werner the same: Prefers shaded the larval breeding places, par- ticularly at the edges of swiftly running small streams, seepage springs; in jungle and forest, seldom in rice fields. It has been found in swamps, marshes, channels, rivers, and rockpools, once at the mouth of a hill stream, where it Reached the sea; Brackish water was decidedly. Although in 1953 the epidemiological importance of this species is neglected, Swellengrebel (1920a) Gives records of malaria in roomates*An. aitkenii* played a role (though together with other more dangerous species like *An. aconitus), and he found An. aitkenii for 97% in running small streams.*

The discovery of Anopheles species *aitkenii* a big question, because this species had never been caught at the time of the study. Several environmental factors that have the potential for the abundance of this species as follows.Rainfall-season: 2016 Rainfall occurs throughout the year. The dry season usually occurs in the month from October to April. The study was conducted in October, is still going on rainfall [13, 14]. Turns rainfall throughout the year to give effect to the abundance of the species. Rainfall during the research period of

about 180 mm. Temperatures: Temperatures in the region were found of *Anophelesaitkenii* range 24ºC - 26ºC. The temperaturesas one of the factors to support the growth and breeding of the species. Topography: The area were found of *An.aitkenii*heles species are at pernukitan region with an altitude of 326 m above sea level. Is a hilly area with land use form fields, fields and forests.

Size Breeding place: Some rivers with continuous flow, aitkenii Anopheles found in habitat. Rivers became a breeding ground for the species. Depth Breeding place: in the area of research found a river with a depth <0.5 m. free from contaminants and turbidity <25 NTU. The presence of predators such as fish can not be found in a culture. Water tends to have movement (flow), with a pH of about 6, the nitrate concentration of less than 50 mg / l.
The role of Anopheles aitkenii as a vector for the transmission of malaria, still in the review process. Although the history of this species not act as vectors [bonne wepster&Swellengrebel, 1953 and Knight & Stone, 1997)[21]. The potential for changes to be vectors is possible. The results showed the changing role of vectors of malaria in Purworejo. Research in 2010 found as vector species is *An.aconitus* [10]. In 2014 the species was different as a vector that is An.balabacencis and An.*maculatus* [9]. Very possible An.aitkenii species act as vectors.

The annualy of temperature variete by weather.There are three factors that influence the weather in each region, namely topography, inter-tropical convergen zone (ITCZ), and monsoonal [15]. Global climate change on extreme conditions, giving effect to the micro climate [3]. Global climate change continues to this day. Extreme weather with high air temperature, and low air temperatures up to blizzard felt in many parts of the world [2, 1].Climate change impact on various aspects of life [16,17]. Direct influence on climate change in each region. Indonesia is among countries affected by climate change. Extreme weather increases the risk of the spread of infectious diseases including diarrhea, vector-based disease (vector-borne diseases), including non-communicable diseases malaria, floods [4].

Purworejo potentially affected by global climate change (Mursid, 2012; Ayala, 2009). In 2010 the average flawed rainfall occurs throughout the year, with the average temperature is lower than the annual average temperature. Substitution season has changed from October to April to the next month [18]. Purworejo also fluctuated duration of wet and dry months, which is one of climatic factors [18]

Land units used as the basis for the analysis. Land units resulting from the conduct overlaying various environmental characteristic parameters produces land units. Environmental characteristic parameters used may be altitude region, classification of cases of malaria, land use, and other environmental parameters. Land units have characteristic as the habitat of oraginsm. In these habitats will be found a life of mutual interaction and interdependence [19].The existence of an organism in an area influenced by: 1. The dispers of organisms in a region; 2. The influence of the limiting factors that do not allow the organisms to live and develop according to the tolerance range of living organisms; 3. The changes in the environment that causes the organism is not capable of adaptation or mutation [8, 19]

The organism is controlled by the environment (habitat) in two ways: the threshold in the number of organisms required by all organisms to survive, and the limits of tolerance in which the organism is able to survive and thrive (Black's Law Mann About the limiting factor, 22]. The reaction of the organism in response to environmental changes can be various stages include migration, adaptation or mutation [19].

Population growth over the carrying capacity will provide the load carrying capacity and will happen concept of homeostasis, where the total population will be at a fixed amount, in accordance with the carrying capacity of the existing environment (Cape, 1995).Environmental characteristics resulting from the reaction of various environmental

changes make a habitat for living beings. At the habitat of living beings will grow and evolve organisms. Anopheles are always experiencing dynamic organism, which behaves to grow and thrive.

Anopheles aitkenii as vector, was coclude by laboratory research on parasitology Gadjahmada University. This is the seriously treath of the malaria transmission. Purworejo have several spesies as vector : An.aconitus; An.balabacensis; An. Maculatus. This research conclude new spesies An.aitkenii as a vector.

CONCLUSION

1. Habitat of Anopheles aitkenii was area with high rainfall intensity. Breeding place as the river with flows, with low turbidity <25 NTU. Resting place was area with temperatures around 24ºC-26ºC.
2. *Anopheles aitkenii* was conclude the new spesies and as the vector malaria in Purworejo

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RADIATION DOSE EXPOSURE AND RADIATION PROTECTION EVALUATION OF CRITICAL ORGANS (SALIVA GLAND AND THYROID GLAND) IN MAMMOGRAPHY EXAMINATION

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ABSTRACT
Mammography examination also irradiates some sensitive attached organs. Another factor is design of mammography machine that does not have additional apparatus for protection of other sensitive organs such as the thyroid gland and salivary glands. This study aimed to obtain information of critical organs surface dose values due to the scattering of radiation on craniocaudal projection mammography examinations with the use of recording devices of radiation thermo luminescence dosimeter (TLD). The procedure is carried out on 10 samples of the study. TLD-100 is attached to the surface of the thyroid gland and salivary gland of patients. TLD that has been exposed then processed in the PTKMR-BATAN laboratory to determine the dose received by the patient. The result is that the average value of the scattering of radiation dose in craniocaudal mammography examination which the thyroid gland is 0.045 ± 0.029 mGy (range 0.007 mGy to 0.100 mGy), and salivary glands namely 0.051 ± 0.029 mGy (range of 0.001 mGy to 0.100 mGy). These results indicate a contribution of the dose received in the critical organ of the thyroid gland and salivary glands caused by scattering on mammography examination. The dose is still relatively small, but based on ICRP 60 reports in 1991, that for medical irradiation and scatter radiation has no minimum limit value received by the patient associated with health risk. This mean the slightest radiation on patients can cause stochastic health risks. For any radiation in radio diagnostic particularly mammography, the risk will increase with rising levels of radiation exposure. Surface dose of the thyroid gland and salivary glands are respectively 0.02 mSv and 0.03 mSv, which means that it is possible arising stochastic effects for both still very much less than 1 mSv per year.

Keywords: Radiation protection, scattered dose exposure, mammography, scattered dose of the thyroid gland and salivary glands.

INTRODUCTION

One of X-rays utilization in the field of radio diagnostic is mammography. This examinations is to determine the anatomy of the breast, especially to see the types of in situ ductal carcinoma tumors that by physical examination cannot be detected. Mammography at present time has been used as a routine examination or a screening to determine whether there is an early symptom of an abnormality in the breast. When we perform a mammography, there are many sensitive organs to radiation. They are exposed by scattered or indirectly gain exposure to radiation from mammography examinations. These organs are salivary gland and thyroid gland.

In one mammography examinations usually produce four projections, and mammography machine is not designed to be able to protect others sensitive organs such as the salivary glands and the thyroid gland. So that the radiation dose research on critical organs should really be a serious concern. In addition, very rarely literature report the result of

radiation scattering related to the critical organ in the mammography examination. We need a study relating to the determination of an effective dose of critical organs in mammography examination.

Thyroid gland

According to Dean (1975), the thyroid gland is located in the front lower part of the neck, as shown in Figure 1. This gland consists of two lobes located on the right and left of the trachea. Each lobe size is less than 5 cm long and 3 cm wide. The thyroid gland is wrapped by a thin capsule of connective tissue. Seen through a microscope, these glands consist of a large number of oval or round follicles lined by cubical epithelium and separated from each other by a small network of connective septa. Follicle center space called alveoli.

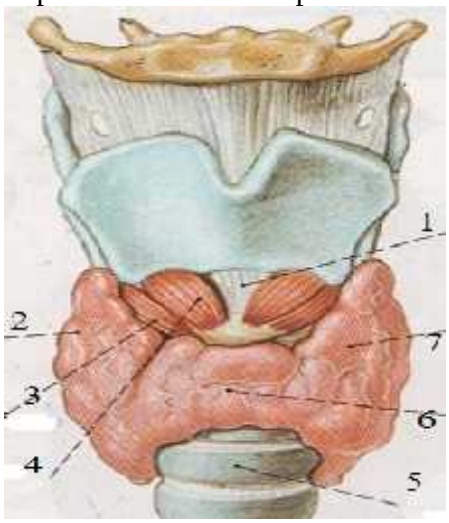

Figure 1. Anatomy of thyroid gland (Sobotta, 2000)
Note; 1 Lig. Cricothyroideum medianum, 2. Glandule thyroidea lobus dexter, 3. M. Cricothyroideus, pars obliqua, 4. M. Cricothyroideus, pars recta, 5. Trakhea, 6. Isthmus glandulae thyroideae, 7. Glandula thyroidea lobus sinister

Salivary gland

According to Sloane (2004), salivary glands secrete saliva into the oral cavity. Saliva consists of enzyme-containing aqueous liquid and viscous liquid containing mucus. Salivary gland consists of three pairs, namely the parotid gland, the submaxilae gland and sublingual gland. Parotid gland is the largest salivary glands, located slightly below and in front of the ear and opens through the parotid duct (Stensen) towards papillae located dealing with both molar teeth. Submaxilae gland size is approximately equal to a walnut and located in the mandible and open through Warton ducts to the bottom of the mouth. Sublingual gland located at the base of the mouth and opens through a small sublingual duct to the bottom of the mouth. Saliva is composed of serous secretion, which is 98% water and contains the amylase enzyme. Salivary glands function is as an anti-bacterial and antibodies, substances secretion, moisturizes and lubricates the food, and dissolve food chemically.

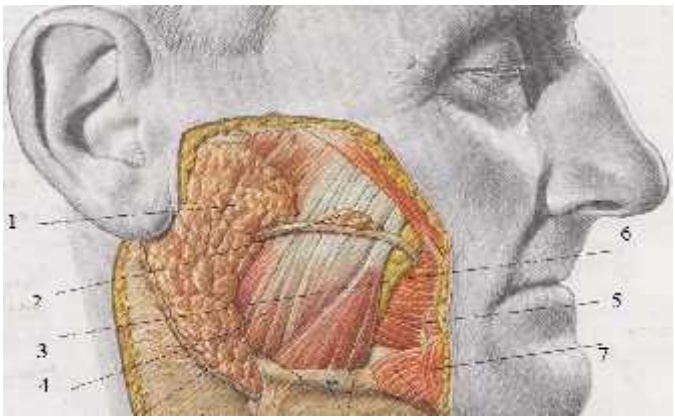

Figure 2. Anatomy of salivary gland (Sobotta, 2000)
Note: 1. Glandula parotidea, 2. Glandula parotidea accessoria, 3.Corpus adiposum, 4. Fascia messeterica, 5. M. Risorius, 6. M. Buccinator, 7. M. Anguli Oris

Mammography

Mammography is one of the special examination on breast using X-rays that have a goal to detect early cancer and only to visualize soft tissue. Mammography can sometimes also be performed on male patients (Van der Plaats, 1969).

The main purpose of mammography is for early detection of breast malignancies. By doing screening, it can decrease mortality and increase the survival rate of breast cancer patients. Mammography screening is performed on women without complaint and without physical abnormalities in the breast, usually performed on women who are at high risk for getting malignancy. Mammography is useful when performed on breast conserving treatment measures, namely to see the recurrence of early breast and looked at the possibility of other abnormalities in the breast.

Mammography machine

The mammographic machine is designed only for the purpose of breast examination with X-ray. The machine has significantly different characteristics when compared with the conventional radiological machine. Tube voltage used approximately 25-35 kVp and target material of the X-ray tube is usually molybdenum. Rhodium can also be used as a target anode.

Figure 3. Mammographic machine (Ballinger and Frank, 2003) and patient position for craniocaudal projection (Lee et al., 2010)

Mammographic window apparatus is usually made of beryllium. Frequently also use an additional filtration and depending on the type anode material used. Mammographic tube using a small focal spot and a rotating anode. Heel effect phenomenon is also very useful in mammography. Compression is done using a radiolucent pedal placed between the breasts. This pedal is used for women who can stand against her but found many feel less comfortable with this compression system. Women with small breasts or with augmentation will not comfort with breast compression.

Mammographic Examination

The patient's breast exposed for two basic projections, namely craniocaudal and mediolateral oblique position. Breast should be propped up strongly and nipple arranged so straight. Radiolucent suppressant is used to suppress the surface of the breast. This compression is done to develop breasts, so it evenly spread over the film. Compression is one of important element in achieving a good quality mammogram. The goal is to obtain the same breast thickness from the nipple to the posterior part of the breast. Put the marker identification in accordance with standard such as the craniocaudal (CC) and mediolateral oblique (MLO). The patient's head is positioned facing the side that is not checked. Central ray directed perpendicular to the base of the breast and the central point on the middle of the breast, which has been adjusted automatically by compression. Instruct the patient to hold their breath and do exposure. Remove the breast compression as soon as possible after completion of the examination.

Radiation dose

The radiation dose or dose can be defined in two main concepts, namely the stored energy per mass medium absorbent, principally tissue, called the absorbed dose. And the effects of the damage caused by X-rays, known as dose equivalent (Martin and Harbinson, 1980). Dose area is defined as the average absorbed dose in the field of X-ray area. Dose area can be measured at any point between the diaphragm in the X-ray tube and patient, but if it is

so close to the patient are then more significant absorbed is back-scattered radiation (Dendy and Heaton, 1999).

Scattered Radiation

In any radiographic examination, there is radiation that can be received directly (primary radiation) corresponds to the beam coming. Due to the interaction of radiation with the medium so it can result in their secondary radiation. Besides collimation factors and intensity of x-ray radiation, the thickness of the object also affects the contribution of scattered radiation on the surrounding tissue. The thicker and more density value of an object, it will provide a greater scattering effect (Curry et al., 1990).

METHOD

The design of this study is quantitative description to determine the effective dose of the salivary glands and the thyroid gland in the craniocaudal projection of mammography by putting Thermoluminesensi Dosimeter (TLD) on the surface of those organs. Research carried out directly at St. Carolus Hospital and TLD processing at PTKMR-BATAN Laboratory.

RESULTS

After the measurement of thyroid and salivary organs surface dose, then TLD processed in the TLD-Reader to get the value of surface dose to the patient. Surface dose values can be seen in Table 1.

Table 1. Surface dose value of the craniocaudal mammogram projection

No	Pasient	Height (cm)	weight (kg)	kV	mAs	FSD (cm)	breast thickness (cm)	salivary dose (mGy)	thyroid dose (mGy)
1	PS 1	165	70	27	110	35/23	5	0.07	0.07
2	PS 2	165	70	27	110	35/23	5	0.07	0.06
3	PS 3	160	62	27	125	45/36	4	0.05	0.10
4	PS 4	159	73	27	125	44/38	3.5	0.07	0.06
5	PS 5	149	50	27	110	56/51	5	0.08	0.10
6	PS 6	152	54	27	125	47/40	6	0.10	0.10
7	PS 7	155	70	26	110	50/43	5	0.09	0.05
8	PS 8	165	67	27	125	36/25	3	0.07	0.03
9	PS 9	160	54	27	125	39/28	4.5	0.04	0.04
10	PS 10	165	67	27	125	37/25	4.5	0.10	0.05
11	PS 11	160	66	27	125	44/38	3	0.01	0.01
12	PS 12	160	65	27	125	56/51	3	0.01	0.01
13	PS 13	160	66	27	125	47/40	3	0.01	0.01
14	PS 14	160	67	27	125	50/43	3	0.02	0.02
15	PS 15	159	70	27	125	36/25	3.5	0.02	0.01
16	PS 16	159	66	27	125	39/28	3	0.03	0.02
17	PS 17	160	66	27	125	37/25	3	0.03	0.03
18	PS 18	159	68	27	125	36/25	3.5	0.04	0.03
19	PS 19	160	60	27	125	39/28	4	0.04	0.04
20	PS 20	159	72	27	125	37/25	3.5	0.05	0.04
Nilai rerata dosis permukaan menggunakan prosesing CR								0.05	0.04

DISCUSSION

Scattered dose measurements in craniocaudal mammography projection using thermoluminesent dosimeter (TLD) to the surface of thyroid and salivary gland has been performed in a number of 20 patients. Exposure factors is in the range of 26-27 kV and 110-125 mAs. Those different exposure factors to do is base on the thickness and density of the breast. The average and frequency of the radiation dose on the mammography examination of the salivary glands and the thyroid gland are shown in table 2.

Table 2. The average and frequency of the radiation dose on the mammography examination of the salivary glands and the thyroid gland

Organs	N	Average	standard deviations	Minimum	Maximum
Salivary glands	20	0.05	0.02	0.01	0.10
Thyroid glands	20	0.04	0.02	0.01	0.10

The result is that the average value of the dose resulting from radiation scattering on craniocaudal mammography for the salivary glands is 0:05 ± 0:02 mGy (range 0.01 mGy until 0:10 mGy) and the thyroid gland is 0:04 ± 0:02 mGy (range 0:01 mGy until 0:10 mGy) with the average thickness of breast is 3.9 cm. The dose is still relatively very small. The report is based on ICRP 60 of 1991, that for medical irradiation and scattering has no minimum limit radiation received by the patient associated with health risks. This mean that the slightest radiation on patients stochastic can cause health risks. For any radiation in radiodiagnostic particularly mammography and radiation doses caused by the scattering, the risk will increase with increasing levels of radiation exposure.

The health risks caused by scattering radiation on the examination is calculated based on the surface dose of thyroid and salivary glands each of which is 0:02 mSv and 0:03 mSv. It indicate that stochastic effects are possible arise for both is still very much less than 1 mSv per year based dose the maximum recommended ICRP for the public. However the way to the risk of stochastic effect within a very long time (even though the radiation dose received is very small), it is necessary to step-by-step procedure for reducing the dose received at the two critical organ through. It can be done by the use of collimation or the irradiation field opened in accordance with the object to be examined (breast area). Subsequent handling of the radiation protection is wearing protective layer for thyroid gland and salivary glands during a mammography. Figure 4. shows a model that can be used to protect the thyroid organ and organ salivary glands. So with the use of such protective tools, scattering dose distributions of the two critical organs can be minimized.

Figure 5. Protective layer for salivary n thyroid gland during mammography

CONCLUSION

The average of 20 samples studied value of the scattered radiation dose on the thyroid gland is 0.045 ± 0.029 mGy (range 0.007 mGy to 0.100 mGy), and salivary glands namely 0.051 ± 0.029 mGy (range of 0.001 mGy to 0.100 mGy). Scattering dose obtained on mammography for thyroid and salivary gland is based on reports RSNA. The surface dose of thyroid and salivary glands are respectively 0:02 mSv and 0:03 mSv, which means that it is possible arising stochastic effects still very much less than 1 mSv per year.

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CORRELATIONS OF DUST LEVEL AND LPS ENDOTOXIN LEVEL IN COTTON DUST WITH THE DECLINE OF LUNG FUNCTION AND RESPIRATORY COMPLAINTS OF COTTON WORKERS

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ABSTRACT
One of the polluter factor in textile industry is cotton dust in which affect of workers health. The contained of LPS Endotoxin in cotton dust might affect inflammatory reaction towards respiratory tract if it is inhaled, which will be continued in affecting lung function and caused respiratory disruption. This research aims to determine the contained level of cotton dust and LPS endotoxin in ambient dust with Decline of Lung Function and Respiratory Complaints of Workers after worked in a day.This study was crossescional approach. The research is conducted in spinning cotton factory at Sidoarjo, using 16 morning shift workers as respondent. Techniques for collecting data were interview, laboratory test and spirometry. The result showed that there was no significant relations (Pearson correlation, $p>0.05$) between ambient dust with lung function decline. LPS Endotoxin in ambient dust was significantly related to declining FEV_1 and $\%FEV_1$ (Pearson correlation, $p<0,05$). There is a correlation between packyears workers' characteristic with respiratory complaints (Pearson correlation, $p<0,05$). Therefore, it is necessary to conduct health program and workers safety properly by the owner enterprise to protect his workers health.

Keywords: cotton dust, LPS endotoxin, Lung function, respiratory complaints, workers

INTRODUCTION

Work environment is defined as a potential source of danger that may occur in the workplace as a result of their work process. Air quality working environment can play a role in terms of occupational health. In cotton spinning, exposure to dust can be a variety of occupational disease namely pulmonary function impairment and disability. This is in line with that proposed by Mukono, that the main absorption for the toxicant is the respiratory tract, lung or eye irritation where the absorption of toxicant in the lung is usually in the form of gases and particles (Mukono,2000).

A syndrome called byssinosis with complaints of typical distress in the chest and shortness of breath on the first day of work after the holiday is often found in cotton spinning workers. This symptom will be reduced if the workers leave the work environment. This complaint arise due to obstruction of the respiratory tract.

Endotoxin is a combination of lipid (lipid A) and polysaccharide chain contained in the lining of the outer membrane of gram-negative bacteria and is released into the surrounding environment during cell growth on or in the process of lysis or when bacteria difagosit by macrophage cells in the body's defense system (system immune). LPS endotoxin has been known to cause inflammation in the exposed tissue, including lung tissue.

One of the cotton spinning enterprises in Sidoarjo with a production capacity of $\pm$2 ton/day becomes the object of this study due to the condition of factory space filled with fluttering cotton dust as a result of the unavailability of dust extraction systems that the cotton dust is potentially causing respiratory problems for workers. Based on the initial

dust measurements obtained dust levels exceeding the NAB by the Minister of Manpower and Transmigration Per.13/Men/X/2011 on Threshold Limit Values Physical Factor and Chemical Factor in Workplace of 0.2 mg / m^3 for 8 hours a day or 40 hours a week.

This study aimed to analyze the decline in pulmonary function and respiratory symptoms in workers exposed to cotton dust endotoxin LPS room at a cotton mill.

METHOD

This study is an observational analytic research without intervention. The research design that will be used in this research is *crossectional.* The study sample consisted of all workers of cotton spinning X for morning shift as many as 16 people, after obtaining inclusion criteria, among others, aged 18-60 years old, no history of chronic respiratory disease previously, never worked anywhere else that generates exposure to high dust and willing to become respondents of the research. Data were collected by indoor dust sampling by using HVS, measurement of lung function with a spirometer were performed before and after working for 1 work shift (8 hours) and interviews. The dependent variable is the observed is the decline in lung physiology of respondents after working for one day and respiratory complaints perceived. The independent variable is the amount of dust room measured gravimetrically and LPS endotoxin levels in the dust measured by the method of *Limulus Amebocyte Lysat* (LAL). Data analysis was performed by descriptive and analytic. The test used is the Shapiro Wilk normality test (sample size <50) differential test of paired samples for differences in lung function before and after work, to know the relationship between independent and dependent variables it is used correlation test of *Pearson or Spearman*.

RESULTS AND DISCUSSION

Indoor levels of cotton dust and endotoxin LPS existing cotton dust in the workplace as follows:

Table 1. Distribution of cutton dust level and LPS Endotoxin level in cutton dust

	Cutton Dust Level (mg/m^3)	LPS Endotoxin Level (EU/m^3)
Average±SD	10.98 ± 1.7	29.142 ± 99,88
Min/Max	8.32/12.92	193.43/405.91

Table 1 shows the average levels of cotton dust in the room of spinning cotton by 10,98 ± 1,7 mg/m^3 with the lowest value 8,32 mg/m^3 and the highest 12,92 mg/m^3. None of the tests that meet the NAB. LPS endotoxin levels for indoor cotton dust 29.142 ± 99,88 EU/m^3 with the lowest value 193,43 EU/m^3 and the highest 405,91 mg/m^3.

Table 2. Difference of Lung Function Value Before and After Working Hours(Cross Shift)

Parameter	**P**
FVC (L)	0,016
%FVC (%)	0,022
FEV_1 (L)	0,001
$\%FEV_1$ (%)	0,002
$\%FEV_1/FVC$ (%)	0,480

Value represented in significance (p)

According to table 2 above it is known that pulmonary function checks of cotton spinning workers show statistically significant differences in FVC, %FVC, FEV_1, and $\%FEV_1$ between before and after the work day. Whereas for $\%FEV_1/FVC$ is statistically unchanged.

Table 3. Correlations Of Cutton Dust Level With The Decline Of Lung Function And Respiratory Complaints

Variable	Cutton Dust Level (p)	R
Δ FVC	0,822	0,140
Δ %FVC	0,782	0,172
Δ FEV_1	0,866	0,106
Δ $\%FEV_1$	0,949	0,040
Δ $\%FEV_1/FVC$	0,920	-0,063
Respiratory Complaints	0,166	0,725

α = 0,01

Based on table 3 above, using the Pearson correlation test can be seen there is no correlation between the levels of cotton dust room with a decrease of FVC (p = 0,822; r = 0,140), decrease of %FVC (p = 0,782; r = 0,172), decrease of FEV_1 (p = 0,866; r = 0,106), decrease of $\%FEV_1$ (p = 0,949; r = 0,040), decrease of $\%FEV_1/FVC$ (p = 0,920; r = -0,063), and respiratory complaints (p = 0,166; r = 0,725). Prihata (2003) said that cotton dust concentration relatinship with lung function capacity in textile production workers in Cirebon, showed that the average concentration of cotton dust by the workers is 1,584 mg/m^3 which causes a decrease in lung function of workers by 72,9 %. It is very risky to the occurrence of occupational diseases, especially respiratory problem

Table 4. Correlations Of LPS Endotoxin Level In Cotton Dust With The Decline Of Lung Function And Respiratory Complaints

Variable	**LPS Endotoxin (p)**	**R**
Δ FVC	0,840	-0,126
Δ %FVC	0,834	-0,131
Δ FEV_1	0,022	-0,931*
Δ $\%FEV_1$	0,020	-0,935*
Δ $\%FEV_1/FVC$	0,266	-0,618
Respiratory Complaints	0,792	0,164

* α = 0,05

** α = 0,01

Table 4 above can be seen there is a significant correlation between the level of endotoxin LPS in the cotton dust room with a decrease of FEV_1 (p = 0,022; r = -0,931),

decrease of % FEV_1 (p = 0,020; r = -0,935). Whereas with other parameters, namely a decrease of FVC, decrease of %FVC, decrease of %FEV_1/FVC, as well as respiratory complaints there is no significant correlations.

A research by Simpson *et al* (1999) determine the concentration of cotton dust in the blowing of 1,07 (0,72-5,9) mg/m^3 with the concentration of endotoxin 9730 EU/m^3. Christiani *et al.*(2003) found the concentration of cotton in the unit of carding 1,58 (0,74-2,58) mg/m^3, endotoxin 3440 EU/m^3.

Health effects of cotton dust can be acute or chronic.The correlation between worker characteristics (age, length of employment, nutritional status / IMT, packyears) with decreased lung function and respiratory symptoms were analyzed using Pearson correlation statistical tests. While the correlation characteristics of workers, namely the use of PPE with decreased lung function and respiratory symptoms were analyzed using Spearman correlation statistical test. The results are presented in Table 5 . From table 5 it can be known that there is no correlation between worker characteristics such as age, length of employment, nutritional status / IMT, packyears, and use of PPE with decreased lung function and respiratory complaints, except packyears correlation with respiratory complaints (p = 0,039; r = 0,519).

Table Table 5 Correlation of Characteristics of Workers with Lung Function Decreased and Respiratory Complaints

Variable	P (ΔFEV_1)	P ($\Delta\%FEV_1$)	p (ΔFVC)	p ($\Delta\%$FVC)	p ($\Delta\%FEV_1$/FVC)	p Respiratory Complaints
Age	0,976	0,718	0,840	0,668	0,912	0,100
Variable	P (ΔFEV_1)	P ($\Delta\%FEV_1$)	p (ΔFVC)	p ($\Delta\%$FVC)	p ($\Delta\%FEV_1$/FVC)	p Respiratory Complaints
length of employment	0,426	0,321	0,885	0,951	0,504	0,702
nutritional status (IMT)	0,255	0,540	0,271	0,177	0,086	0,479
Packyears	0,137	0,108	0,805	0,611	0,124	0,039*
PEE	0,280	0,358	0,596	0,650	0,358	1,000

*p<0,05

Examination of lung function is useful for finding early respiratory disorders. Examination of lung function is important to determine pulmonary function abnormalities. In this case it must involve at least two parameters: forced expiratory volume in 1 second (FEV_1) and the capacity of coercion (FVC) (Alsagaff and Mukty, 2010). In this study, the measured parameter is FVC, FEV_1, and ratio FEV_1/FVC.

Identification of respiratory symptoms in this study it was using a standardized questionnaire of ATS respiratory complaints (*American Thoracic Society*) and then carried out a scoring with a mild criteria (≤ 30%), intermediate (31 – 69%) and heavy (≥ 70%).

Respiratory complaints is a disturbance in the respiratory tract as a result of seldom exposed to air pollutants, while the definition of respiratory tract is the organ ranging from nose to the pulmonary alveoli and their organs such as sinus pranasal adneksa, the middle ear space and others.

CONCLUSIONS

This research concludes that there was no significant relations between cutton dust (ambient dust) with lung function decline. LPS Endotoxin in ambient dust was significantly related to declining FEV_1 and $\%FEV_1$. There is a correlation between packyears workers' characteristic with respiratory complaints. Therefore, it is necessary to conduct health program and workers safety properly by the owner enterprise to protect his workers health. Even more importantly, all of the workers involved should consider adopting a healthier lifestyle by reducing or avoiding the consumption of cigarette and doing regular exercise.

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FACTORS THAT INFLUENCING THE THE BEHAVIORAL INTENTION OF SUSTAINABLE WASTE MANAGEMENT ON JUNIOR HIGH SCHOOL STUDENTS IN CITY OF PADANG

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ABSTRACT
The low awareness of the population to implement sustainable waste management behaviors affect the increasing amount of waste in the environment. Sustainable waste management is regarded as an effective measure to reduce the cost of collecting, transporting, and processing of waste. This study aimed to analyze the influence of attitude, subjective norm and perceived behavioral control intention and effect of knowledge on the attitudes towards sustainable waste management behavior. This research is a quantitative research with cross-sectional design. Population is junior high school students in the city of Padang. Samples were taken by proporsionate to size random sampling technique. Analysis of survey data using structural equation modeling (SEM) with AMOS.21 program. The results of this study stated that knowledge influencing students attitudes towards sustainable waste management behavior (CR = 2.067; p = 0.039). Attitudesinfluencingthe the behavioral intention (CR = 3.479; p = 0.001). Subjective norms influencing the the behavioral intention (CR = 5.616; p = 0.001). Perceived behavioral control (PBC) influencing the the behavioral intention of sustainable waste management (CR = 2.532; p = 0.011). Knowledge influencing students attitudes towards sustainable waste management behavior. Attitude, subjective norm and PBC influencing the the behavioral intention of sustainable waste management in junior high school students. Suggested to Padang City Department of Education to incorporate the teaching materials on sustainable waste management in the curricula of environmental education on Junior High School

Keywords: Intention, sustainable waste management, junior high school

INTRODUCTION

The amount of waste as one of the important products of urban lifestyle, growing faster than the numbers of urbanization. Currently, the number of urban population has increased to about 3 billion people who produce 1.3 billion tons of waste per year. It is estimated that in 2025 the urban population will increase to 4.3 billion people and produced 2.2 billion tons of waste per year (World Bank, 2012).

Waste that is not maintained properly not only have a negative impact on the natural environment, but also to the quality of human health (Miller T, 2004). Sustainable waste management (SWM) is considered as an effective measure to reduce the cost of collecting, transporting, and disposing of waste. SWM behavior is defined as efforts to reduce waste (reduce), reusing waste that is suitable to be used (re-use), recycling, and convert the waste into energy source (waste to energi) (Zhou Y, 2010).

Understanding and explain the SWM behavior can use the psychological theory approach on the relationship of attitudes and behaviors, especially a theory that can predict behavior. Theory of Planned Behavior (TPB) developed by Ajzen (1991) widely applied to explain the intention of which is the nearest antesenden of behavior, that the intention or the intention of a person to be a determinant of whether someone will doing or not doing certain behaviors.

According to Ajzen (2005), the the behavioral intention to implement SWM is measured through three determinants. The first determinant related to the individual's attitude towards SWM behavior, The second determinant with regard to how much the perceived social pressure to implement such behavior (subjective norm), and third determinant related to the perception of its controls in relation to the such behavior are referred to as perceived behavioral control (PBC).

Padang as the largest city in West Sumatra, Indonesia facing the problem of waste that needs serious handling, which waste generation continues to increase every year. Based on previous studies reference the average urban waste generation daily in the city of Padang reached 3.050 m3 (784 tons), while only 400 tons / day (51%) of the generated waste can be transported to the landfill. Waste that has not been transported generally accommodated in a temporary disposal container which is located on the edge of the road, the angle fork in the road or a particular road. That condition can lead to negative impacts on the environment, because it creates unpleasant odors, reduce the smoothness of traffic, reducing the beauty of the city, it can even become disease

The establish of a SWM behavior in junior high school students that oriented to sustainable development can be a role model for the SWM behavior in the family and the environment. The influence of attitudes, subjective norms, and PBC towards the the behavioral intention to implement SWM and the influence of knowledge towards attitude towards SWM behavior is a problem that want to be obtain the answered in this study.

METHOD

This research was a cross sectional survey. Based on the purpose and hypothesis of the study determined the variables used in this study. There are five variables: knowledge, attitude, subjective norm, PBC, and the behavioral intentions. Furthermore, the instrument development research done through the study of literature for the variable knowledge and intentions and beliefs elicitation for variable attitude, subjective norm and PBC. Subsequently determined the population, sample and sample size.

Population are all of SMPN 18 and MTsN Model students in the city of Padang. The number of samples in this study were 200 students who calculated the proportion of the hypothesis test formula. Sampling technique with proporsionate to size random sampling.

Data collection was conducted by questionnaire and interview. Inferential analysis in this study using Structural Equation Modeling (SEM). SEM are statistical techniques that allow testing of a relatively complex set of relationships simultaneously. SEM is a combination of factor analysis and regression analysis and applied separately in the factor analysis (Confirmatory Factor Analysis) or simply regression analysis (Sugiyono, 2007). Results of the analysis are interpreted and then concluded in accordance with the purpose of the study and were given advice.

The conceptual framework that explains the relationship between variables in this study is shown in Figure 1.

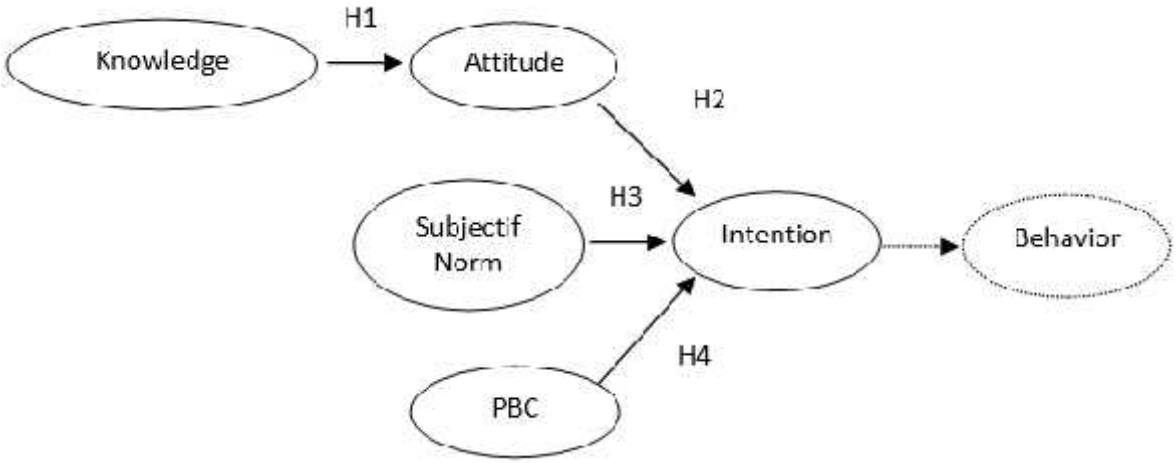

Figure 1. The conceptual framework

1. Measurement Model

The comparative analysis in this study followed the steps of Structural Equation Modelling (SEM). Prior to forming the Full Model SEM, first testing the indicators that formed each of the variables. Testing was done by using confirmatory factor analysis (CFA), which is used to test the validity and reliability of latent variables and indicators. CFA results obtained value of factor loading of items forming the latent variables are less than 0.5 were not included for analysis Full SEM Model. Cronbach's Alpha value of all exceed the limit of 0.7 and acceptance as well as the variance extracted (VE) are all above the acceptance limit of 0.5. Next based on the confirmatory factor analysis, all the indicators for measuring latent variables can be used for subsequent analysis without modifications or adjustments.

2. Structural Model

Structural modeling using SEM to identify variables that relate directly or indirectly to the the behavioral intention or the intention of students to apply or not to implement sustainable waste management behavior.

Figure 2 shows that the largest contribution to the intention of students to implement sustainable waste management behavior given by the subjective norm of 45% ($\beta = 0.45$), followed by the attitude of 26% ($\beta = 0.26$), and the lowest contribution is PBC at 18% ($\beta = 0.18$).

Attitude towards sustainable waste management behavior is determined by four indicators. Based on modeling results, respectively the largest load factor is the statement that sustainable waste management takes time to learn by 0.93, making the school environment becomes narrower by 0.72, causing the school uniform to be dirty by 0.70, and the latter requires a lot of energy 0.64.

Subjective norm means that the people who are considered influential by students to apply or not to implement sustainable waste management behavior. Based on modeling results, load factors ranging from the largest is the teachers grade of 0.89, followed by the headmaster was 0.78, and friends who disciplined and good behavior of 0.67, a parent at 0.65 , and school guard of 0.45.

PBC is determined by eight indicators. Based on modeling results, students' perception of their ability to control the factors that facilitate or are difficult to implement sustainable waste management behavior, respectively the top four according to the load factor is:

adequate tools and materials of 0.82, followed by lack of funds for the implementation of 0.77, the absence of specialized learning of 0.77, and the direction of the school health supervisors of 0.76.

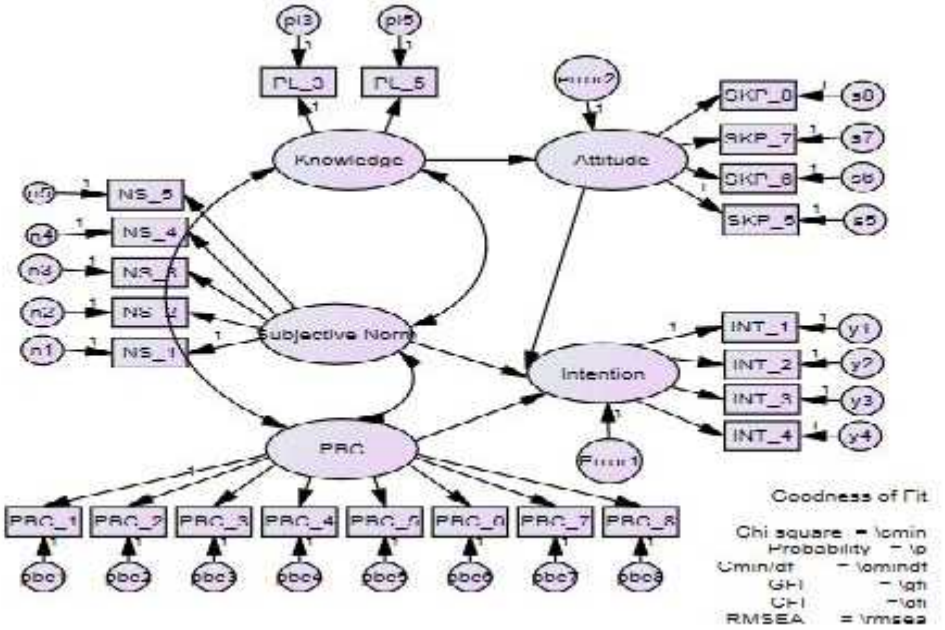

Figure 2. Stuctural Models

3. Hypothesis test

Testing the hypothesis of causality developed in the behavioral intention model of sustainable waste management is performed by t test commonly used in the regression models. The following table shows the values of the critical ratio / CR (in the analysis of SEM with AMOS, CR value identical to the value t in the regression analysis).

In table 1 shows that the whole causal relationship between endogenous with exogenous variable has a value of CR> 1.96 using a 5% significance level. So all the null hypothesis (H0) proposed in this study was rejected. From the results of this study concluded that there is the influence of knowledge on attitude (H1), there is the influence attitudes toward the behavioral intention (H2), there is the influence of subjective norms on the behavioral intention (H3), and there is the influence of PBC on the behavioral intention (H4).

Table 1. hypothesis testing

The Influence			*Estimate*	*S.E.*	*C.R.*	*p-value*
Attitude	<---	Knowledge	0,40	0,19	2,07	0,039
Intention	<---	Attitude	0,21	0,06	3,48	0,001
Intention	<---	Subjective Norm	0,40	0,07	5,62	0,001
Intention	<---	PBC	0,16	0,06	2,53	0,011

Large of contributions and direction of the relationship can be seen from the Standardized Regression Weights in full model as shown in the table below.

Table 2. *Standardized Regression Weights*

Relationship			*Estimate*
Attitude	<---	Knowledge	0,24
Intention	<---	Attitude	0,26
Intention	<---	Subjective Norm	0,45
Intention	<---	PBC	0,18

In Table 2 shows that the knowledge of sustainable waste management influence attitudes towards sustainable waste management behavior (β=0.24; p=0.039). Furthermore, attitudes towards sustainable waste management behavior influence the the behavioral intention (β=0.26; p<0.001). Subjective norms influence the the behavioral intention (β=0.45; p<0.001). Recently, PBC influence the the behavioral intention of sustainable waste management by (β=0.18; p=0.011).

DISCUSSION

The rationale of this study was to scan and observe determinants of the behavioral intention of sustainable waste management and also to ensure the relative strength of each determinant factors which consists of attitudes, subjective norms, and perceived behavioral control. This study also discusses the influence of knowledge about sustainable waste management behavior towards attitudes towards sustainable waste management behavior. Overall, the study was conducted by using the theoretical framework of theory of planned behavior to understand the differences contributions of determinants of the behavioral intention of sustainable waste management in a single framework that at its peak led to a sustainable waste management behavior. The results of the structural model shows a good of fit (fit) based on the value of goodness of fit is generated.

The results of this study stated that knowledge about sustainable waste management behavior influence on attitudes towards sustainable waste management behavior. These results are consistent with theoretical assumptions of theory of planned behavior and in line with the findings obtained by Ramayah et al (2012), which explores the behavior of recycled environmentally conscious by using the theory of planned behavior.

These results are also consistent with the results of the study of Kumar (2012) which states that the environmental knowledge related to attitudes towards environmentally friendly products. Communication and education efforts to increase knowledge on issues relating to environmental concerns has been effective in encouraging the disposition of behavior that is considered good for the natural environment (Sidique SF, 2010). These results also support findings Cheung et al (1999) that found a general knowledge of the environment can significantly predict the behavior of recycled paper.

The results of this study stated that the subjective norm influence the behavioral intention of sustainable waste management. Subjective norm which refers to perceived social demands to perform or not perform certain behaviors found to influence the the behavioral intention to implement sustainable waste management. These results are consistent with the theoretical assumptions of the theory of planned behavior by Ajzen (2005) which states that the subjective norm as a determinant factor to apply or not to apply certain behaviors. This result is consistent with findings of researchers previously stated that the subjective norm has a significant relationship with the intention as reported by some previous researchers (Kumar B, 2012; Cheung et.al, 1999; Chaisamrej R,2006).

The results of this study stated that perceived behavioral control (PBC) influence the the behavioral intention to implement sustainable waste management. These findings support the assumption in the theory of planned behavior by Ajzen (2005) that the intention is influenced by the PBC. This result is in line with the results of research Kumar (2012) which states that PBC had a significant association with the intention to buy environmentally friendly products.

Overall the model that uses the framework of the planned behavior theory capable to explaining the the behavioral intention of sustainable waste management with good approach with simple and adequate way for developing countries like Indonesia. The feasibility of the planned behavior theory is consistent with the findings of Kumar (2012) and Ramayah et all (2012). There is a dearth of research that studies the relationship of environmental knowledge with attitudes towards environmental issues in the context of Indonesia even though the same thing has been studied in geographical conditions such as in Malaysia. The study also managed to fill this gap.

CONCLUSION

Based on analysis of determinants of the the behavioral intention of sustainable waste management in junior high school students in the city of Padang, be concluded that the knowledge on sustainable waste management influence the attitudes towards of sustainable waste management. Attitudes towards sustainable waste management behavior, subjective norms, and perceived behavioral control influence the the behavioral intention of sustainable waste management. Structural model of the the behavioral intention of sustainable waste management at junior high school students in Padang have good psychometric value (valid, reliable, and modeling fit).

The study provides a theoretical and practical implications how the knowledge influences attitudes towards sustainable waste management behavior and how attitudes, subjective norms, and PBC influences the the behavioral intention sustainable waste management. In an effort to implement sustainable waste management behavior in junior high school students, local governments must pay attention to the determinants of the the the behavioral intention and its indicators.

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DETECTION OF 8 HYDROXYDEOXYGUANOSIN AS AN INDICATOR OF DNA DAMAGE RESULTED FROM SILVER ION WATER EXPOSURE

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ABSTRACT
The aims of the study was to analysis the toxic effect of Silver ionic water 5, 10 and 15 ppm exposure in the DNA cell damage of the mice. The Forming 8 OhdG (8 hydroxy deoksiguanosin) use as an indicator there was a damage in the DNA cause by silver ionic water. This study was an analytical laboratory experimental research. 24 male mice were divided into 4 group : using silver ionic water 5 ppm exposure, using silver ionic water 10 ppm exposure, using silver ionic water 15 ppm exposure, using aquadest (control group). Each group exposure per oral 1ml/day for 7 days. After 7 days, the mice were sacrified. The 8 OHdG were examined from the blood using thiobarbituric acid test. The research showed that silver ionic water 15 ppm formed 8 OhdG after exposure, with significant increase ($p<0,05$). There are no significant diference between control group with group exposed by silver ionic water 5 ppm, 10 ppm and between 10 ppm and 15 ppm, However there is significant diference between control Group with group exposed by silver ionic water 15 ppm . 8 OhdG were formed after silver ionic water exposure orally. Forming 8 OhdG (8 hydroxy deoksiguanosin) indicating there was DNA cell damage. The damage to DNA Cell may cause necrosis cell and that happened after exposed by silver ionic water 15 ppm.

Keywords : Silver ionic water, 8-OHdG

INTRODUCTION

A silver ion (Ag+) has long been known as a substance that can kill and prevent bacterial growth. A silver ion (Ag+) is effective for healing burns, severe chronic osteomyelitis, urinary track infection, and venous catheter infection (Feng, 2000). As a nanoparticle silver ions (Ag+) are used in a wide variety of biological applications such as medicine, antibacterial, transfection vector, and fluorescent label (Asharani, 2008). One study explains silver ions (Ag+) water is effective fighting and killing of hundreds of viruses, bacteria, germs, fungi, and parasites just a few minutes after contact. In addition, silver ions (Ag+) water can be used in treating periodontal disease, used to eliminate bad breath, gingivitis, and root canal disinfection (Altman, 1995).

Despite silver ions (Ag+) development is very rapid since it has a variety of functions and presents as a new breakthrough in the field of nanotechnology, information on the negative effects due to silver ions (Ag+) administration at various concentrations remains rare (Asharani, 2008) and up to now no agreement has been reached on silver ions (Ag+) toxicity to human cells.

Lansdown in 2006 wrote that silver ions can be absorbed by human body and accumulates in the liver, lung and brain with minimal damage or even without any damage to those organs. One indicator to see the effect on heavy metals toxicity, including silver ions (Ag+), is the formation of oxidative stress. According to studies, silver ions can increase oxidative stress that would interfere with cell survival (Chudobova, 2013). Oxidative stress has a specific effect on cells, including oxidative damage to lipids, proteins and DNA. One indicator of DNA damage by a carcinogenic substance is the formation of the compound 8-hydroxydeoxyguanosine (8-OHdG) as a result of DNA

nucleosides oxidation. DNA oxidative damage may be expressed as the damage to bases and DNA phosphodiester bond due to the lack of improvement of the base excision repair (BER) and oxidative base damage relieving enzymes, such as DNA glycosilase, hydroxy methyl uracilglycosilase and 8-oksoG DNA glycosilase (Harliansyah, 2011).

ROS (Reactive Oxygen Species) appears because exposure to silver ion water in large quantities without being offset by the amount of antioxidants may lead to oxidative stress conditions, which would be very harmful to the body. It is undeniable that DNA damage may be caused by ROS (Reactive Oxygen Species) formation. One of the compounds resulting from DNA damage is the 8-OHdG (8-hydroxydeoxyguanosine) which is the result of DNA oxidation and can be used as one indicator of toxicity of a particular substance. DNA damage is preceded by DNA oxidation that, later on, if cells cannot make reparation, may result in the disruption of DNA repair and results in cell death (pyknosis, Karyorrhexis, and karyolysis) or cell mutation may occur which will lead towards malignancy. The occurrence of DNA damage in cells may result in cell death or cell mutation. One way to examine DNA mutation is by examining of chromosomal aberrations (Asharani 2009).

MATERIALS AND METHODS

Materials

Experimental animals

Animals used in this study were mice with a weight of 30 grams aged 2 months. Feed used was in the form of pellets, and the drink was mineral water for control group and the treatment group received water silver ion in concentrations of 5 ppm, 10 ppm, 15 ppm.

Drinking provision

Silver ion water is liquid containing silver ions, administered by mouth to mice in concentrations of 5 ppm, 10 ppm, and 15 ppm for 7 days.

8-OHdG (8-hydroxy deoxyguanosine)

8-OHdG (8-hydroxy deoxyguanosine) is the amount of oxidative compounds in mice blood formed by the provision of various concentrations of silver ion water of 5 ppm, 10 ppm, and 15 ppm.

Research methods

This study was an analytic experimental study. There were four groups of mice, each group consisting of 7 animals, the control group, group receiving 5 ppm silver ion water, group receiving 10 ppm silver ion water, and group receiving 15 ppm silver ion water. For 7 days each group was given with silver ions drink per oral according to each concentration. On day 7 blood samples were taken for the serum and 8-OHdG test was carried out. 8-OHdG test results were read using a spectrophotometer. Results of absorbance were subsequently converted into the 8-OHdG concentration in n/ml.

Figure 1. Blood was taken from the experimental animals for 8 OHdG examination

Data analysis

Data analysis was performed using a test one-way Anova with significance alpha 0:05 and Tukey test.

RESULTS AND DISCUSSION

Results of 8 OHdG examination

8 OHdG examination is one of the tests to examinr the toxicity of a substance as an indicator of DNA damage. 8 OHdG is the result of DNA oxidation due to the presence of ROS formation.

Table 1. Mean and significance test of silver ions water with the control group

Groups	n	8OHdG Mean ± SD	Significance test with control group
Control	6	0.30397 ± 0.474627	-
Silver ion water 5 ppm	6	0.40282 ± 0.713692	0.996
Silver ion water 10 ppm	6	0.57806 ± 1.66480	0.979
Silver ion water 15 ppm	6	1.66480 ± 1.067921	0.031

Lowest formation of 8 OHdG occurred after the administration of 5 ppm silver ions water, while the highest after the administration of 15 ppm silver ions water (Table 1). Kolmogorov-Smirnov test result was obtained $p>0.05$, meaning that the data were normally distributed. Significance test with the control group showed that treatment group receiving 15 ng/ml silver ion water was the group with significant difference.

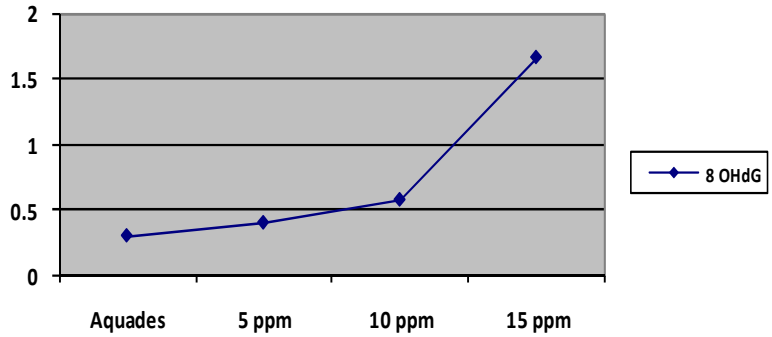

Figure 2. 8 OHdG formation

Results of homogeneity test revealed p= 0.270 (p>0.05), indicating that the data were homogeneous. Data analysis was done using One-way Anova with the results p = 0.024 (p<0.05) indicating significant difference between groups. Significance values between groups could be observed after the Tukey test.

Table 2. Tukey test of 8 OHdG

Kontrol	5 ppm		10 ppm		15 ppm	
Mean ± SD	Mean ± SD	P	Mean ± SD	P	Mean ± SD	P
0.30397± 0.474627	0.40282± 0.713692	0.996**	0.57806± 1.66480	0.979**	1.66480± 1.067921	0.031*
5 ppm	10 ppm		15 ppm			
Mean±SD	Mean±SD	P	Mean±SD	P		
0.40282± 0.713692	0.57806± 1.66480	0.976**	1.66480 ± 1.067921	0.049*		
10 ppm	15 ppm					
Mean±SD	Mean±SD	P				
0.57806± 1.66480	1.66480± 1.067921	0.105**				

*p<0.05 indicating significant difference
**p<0.05 indicating no significant difference

It is apparent that there was no significant difference between control group with 5 ppm group, control group and 10 ppm group, and between 5 ppm group and 10 ppm group. However, there were significant differences between control group and 15 ppm group, 5 ppm group and 15 ppm group, and 10 ppm group and 15 ppm group. This was consistent with the results of 8 OHdG examination, which showed that 8 OHdG formation occurred after the administration of 15 ppm silver ion water. The DNA damage that occurs in the cells may result in cell necrosis.

Silver ions water may lead to Reactive Oxygen Species (ROS) by interfering normal function of the mitochondria, by disturbing the process of electron transfer. Silver ions water may bind NADH dehydrogenase, which is responsible for electron transfer process. If the process is interrupted, the production of ROS increases. ROS may cause damage to lipids, proteins and DNA. The presence of DNA damage may lead to the

formation of 8 OHdG (8-hydroxydeoxyguanosine) that can be used as the indicator of DNA damage.

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AFEASIBILITY STUDY OF BOTTLED WATER PRODUCT TO IMPROVE HEALTHY FINANCIAL CONDITION OF LOCL WATER COMPANY (PDAM) IN TRENGGALEK

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ABSTRACT
Local Water Company in Trenggalekhas been experiencing unhealthy financial condition. Based on the financial statements at the end of 2015, PDAM has been losing money Rp 3,226,457,214.00 which makes it cannot contribute to the Trenggalek regional revenue. Therefore,it is necessary to arrange a proper strategic planning for healthy financial condition, one of which is an innovation of Bottled Drinking Water products. This strategy is deemed appropriate because of the good quality and quantity of water resources and people's interest in consuming bottled water is quite high. This paper will discuss both technical aspects and financial aspects in the innovation of Bottled Drinking Water product so that it becomes a viable strategy to improve PDAM financial. The analysis method employs descriptive analysis of quantitative and qualitative. From the technical standpoint,it is planned to sale bottled water products of 240 ml glass using non RO drinking water machine with a capacity of 2000 liters/hour. Results of the analysis show that the NPV value can achieve Rp 1,425,481,949, -. IRR obtains 33.64% greater than the commercial interest rate of 12%, while BCR is 1.95 greater than 1 and Break Event Point shows that the business payback will be achieved in the fourth year. Referring to the technical and financial analysis, they show that the innovation of Bottled Drinking Water product to improve the financial condition of PDAM isdeemed feasible.

Keywords: Tehnical Aspects, Financial Aspect, Bottle Water Product

INTRODUCTION

Based on an assessment of indicators by BPPSPAM on 2011 – 2015, it discloses the financial aspects of the Regional Water Company Trenggalek which is declared unfit. This is caused by unbalance number of income and operational expenses. PDAM Trenggalek revenue in 2015 amounted to Rp 6,808,586,550.00 while the operational expenses are about Rp 10,180,561,722.00 hence PDAM loss is Rp 3,226,457,214.00. In other words,noteven single rupiah is in Regional Revenue (PAD) which can hamper regional development in Trenggalek. Therefore, it is eminently suggested to plan a strategy to improve PDAM financial condition in Trenggalek.

Potential sources of raw water in Trenggalek are exceptionally abundant. Existing water sources in Dompyong Village, Bendungan District currently become standard water of PDAM BNATrenggalek Regency that has good value in terms of quality and quantity. Debit raw source inDompyongis 1500 liters/sec with an installed capacity of 300 liters/second, but only 80 liters/second are used for the production. Based on the raw water quality testing on the Environment Unit of Labkesda Trenggalek, it displays that the quality of raw water sources in dompyong is in accordance with the terms of potable water from the Regulation of Minister of Health No. 907 of 2002 on terms and Drinking Water Quality Monitoring. Therefore, one strategy to increase PDAM revenue is new product innovation of bottled drinking water. It is also supported by increasing number of consumerswho demand for bottled water from year to year. In 2015, according to data from ASPADIN, the amount of consumer demand for drinking water is 30%.

This paper will analyze and discuss the strategy of product innovation of bottled drinking water to improve healthy financial condition.It covers technical aspects, marketing aspects, Human Resources and financial aspects so that PDAM Trenggalekis able to apply the principle of cost recovery and can increase the Regional Revenue.

MATERIAL AND METHODS

Definition and Types of AMDK

Bottled Drinking Water is divided into four parts, namely mineral water, demineralized water, natural mineral water and dew drinking water. The mineral water is bottled drinking water containing minerals in a certain amount without adding minerals in accordance with SNI 01-3553-2006 or amendment. Mineral water is composed of mineral water, oxygenated mineral water and carbonated mineral water.

Retrieval And Storage Of Raw Water

Water taken from surface water sources is collected in a tank or can flow through a pipeline if it is located far from the production process and if necessary disinfe ctant can be added in the transporting process

Screening / Filtration

The process of filtering the raw water in the bottled drinking water production is divided into three: macrofilter, microfilter and activated carbon. Microfilterscreening is effective filtration using sand with coarse particle filter functions. The sand is equivalent to silica grains and the quality of natural water purification is expressed in NTU unit. Activated carbon filtering may serve to absorb odors, flavors, colors, residual chlorine and organic materials. Microfilter filtering function is to filter fine particles with a maximum size of 10 microns.

Disinfection

Disinfection can serve to kill pathogenic bacteria if using ozone is carried out in the mixing tank or injection of ozone in the pipeline. Levels of ozone in the mixing tank range from 0.2 to 0.6 ppm and the residual ozone levels range 0.1 to 0.4 ppm. The level of residual ozone is done periodically and made recordings. If necessary disinfection wave UV irradiation shall use a wavelength of 254 nm with a minimum intensity of 10,000 mw seconds per cm2. If using silver residue, electrolysis generator is utilized with residual silver in the product up to 25 ppb.

Washing Packaging

Disposable packaging does not have to be washed, but if necessary can be made sanitary. Washing must be done if the packaging is reused and sanitized in the bottle dishwasher. Cleaning the bottle can use safe detergent at a temperature of 55-75 ^{0}C, while for sanitation the ozone water can be used. Prior to washing, visual inspection of the packaging is done thoroughly.

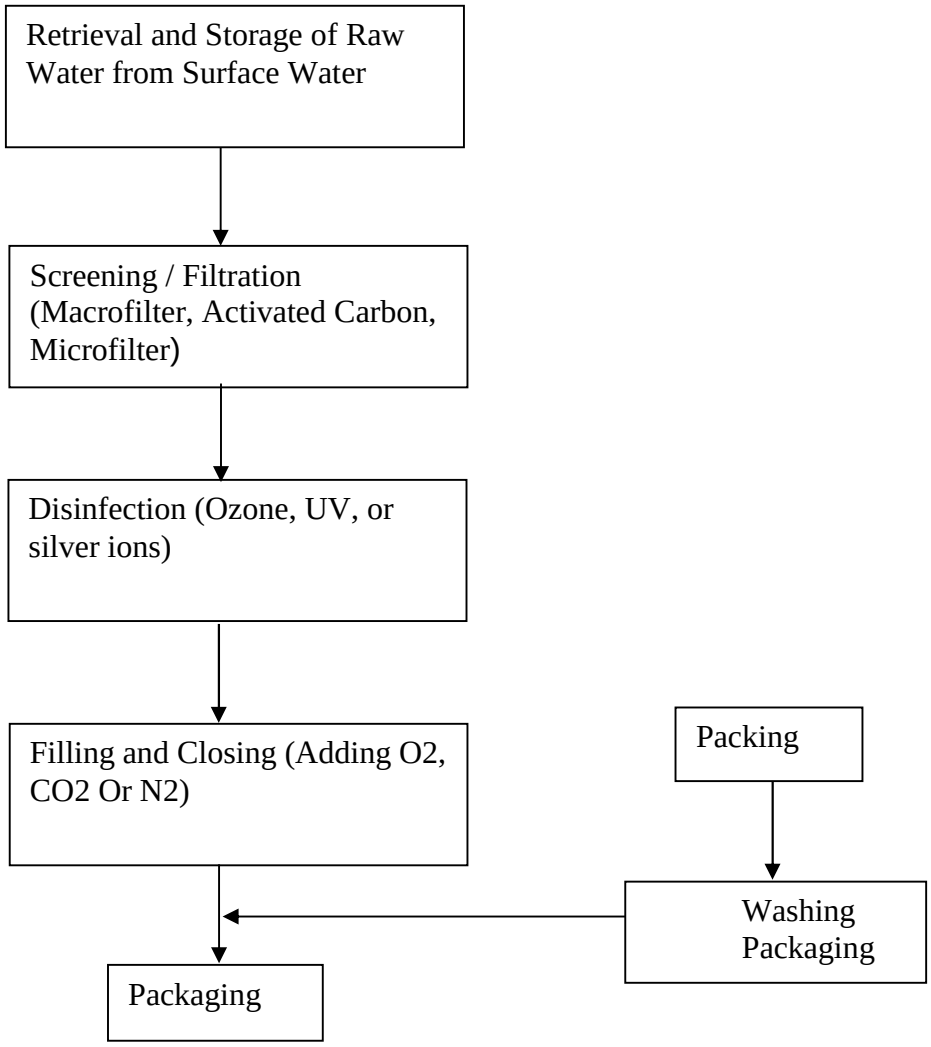
Filling and Closing

Filling and closing the bottle or glass should be done ina hygienically clean filling room and sanitary at room temperature up to 250^{0}C. Filling can be accompanied by the addition of O2, CO2 or N2

Packing

Packing can use cardboard boxes, shrink plastic, plastic crates or other materials.

Figure 1. Flow diagram of the process of bottled drinking water using ground water or water surface sources



Investment Feasibility

A feasible investment can be measured by several criteria, namely Benefit - Cost Ratio (BCR), Net Present Value (NPV), Internal Rate Of Return (IRR), Payback Period (PP) and Break Event Point (BEP)

Net Present Value (NPV)

To analyze the feasibility of a business,it is necessary to calculate the NPV of each alternative in advance. Single alternative can be identified decent if it obtains NPV ≥ 0 with the following equation:(*Raharjo, 2007*)

$$NPV = PV_{income} - PV_{expenses}$$

Benefit Cost Ratio (BCR)

Cost Benefit Analysis is an analysis that is commonly used to evaluate a project. This analysis is done by looking at the ratio between the benefits (income) on the costs incurred by using the formulation as follows: *(Pujawan, 2007)*

B/C = Benefit (Income)/ InvestmentCost

Decision-making criteria for the single alternative are taken based on the B/C obtained. If the value of B/C ≥ 1, the alternative is accepted. On the other hand, if the value of B/C <1, the alternative is not eligible to be accepted: *(Raharjo, 2007)*

Internal Rate Of Return (IRR)

Rate of Return is the interest rate that cause the balance of all income in a given period. In other words, the interest rate that resulted in Net Present is worth to zero. Mathematically this can be expressed:

$$NPW = \sum_{t=0}^{N} Ft(1 + i^*)^{-t}$$

Where:
NPW = Net present worth
Ft = cash flow in a given period
N = life of the project or the period of study of the project
I * = ROR value of the project

Break-Even Analysis (BEP)

The breakeven point is the point when the total cost is equal to the income or the conditions in which the Net Present Value is equal to zero. This breakeven point method can be utilizedto analyze a wide range of issues including:

a. Determining RORin which bothalternative projects are equal
b. Determining the level of production of two or more production facilities which have different configuration costs
c. Conducting an analysis of buying and selling
d. Determining how many years it takes for the company to cover all expenses *(Pujawan, 2007)*

METHODS

Data Collection

This study begins with a search for secondary data on the financial aspects of PDAM Trenggalek inter alia net profit after tax, the amount of equity (capital + reserve), operating expenses, operating income, Total Cash + Cash Equivalents, Total Current Liabilities, Total Revenue Account of Water, Total Water account, Total Assets and Total Liabilities. Other secondary data required, namely the existing condition of Trenggalek people.

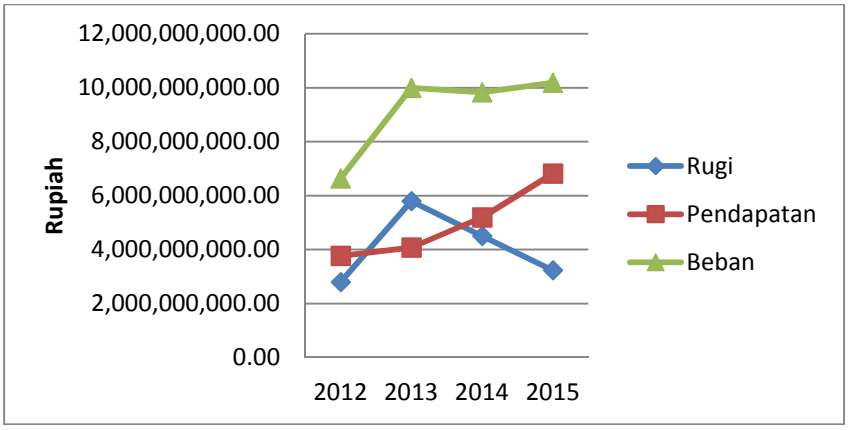
Data Analysis

Secondary data were then processed using performance indicators of the financial aspects from BPPSPAM to determine the financial condition of PDAMTrenggalek. Then,by using descriptive qualitative and quantitative methods, the results of the processed data are analyzed and can be used to determine appropriate strategies to improve healthy financial using innovation of bottled water products.

RESULTS AND DISCUSSION

Crucial indicators to evaluate the financial aspects according to BPPSPAM are Profitability, Liquidity and Solvency. In 2015 Liquidity and Solvency of PDAM Trenggalek got excellent value while Profitability indicators got very poor value indicating the unhealthy financial aspects. There are three factors that make profitability has lower value, namely Operating Expenses, Operating Income, and Profits after taxes as shown in Figure 2.1 below

Figure 2 Profitability of PDAM Trenggalek ranges from 2012 to 2014



Over the last four years,PDAM income has been always increasing, but as a whole over the four years it is in adverse conditions. This is because the operating expenses of PDAM are still exceptionally high which includes personnel expenses, fuel costs, electricity load, maintenance expenses, and depreciation expenses whose value is still high. In 2015 depreciation expense is 5, 6 billion. Regarding the condition of PDAM always lose money from year to year, no rupiah in Trenggalek Revenue is coming from PDAM profits. Therefore,a very precise strategyis necessary to improve PDAM finance and may contribute to regional revenue. The strategyis the innovation of Bottled Drinking Water. The plan is evaluated from two aspects: technical and financial aspects.

Technical aspects

The raw water source to be used for bottled water products are bayong water river located in Bayong village, Bendungan district. This water discharge is 1500 liters/sec and has good quality, so worthy of raw water for bottled water products. Here is a table of raw water quality in Bayong village based on examination of the Environment Unit of Regional Health Laboratory Trenggalek.

Table 1 Comparison of Raw Water quality in Bayong village with drinking water requirements in the Regulation of Health Minister No. 907 of 2002

No	Parameter	Unit	Regulation of Health Minister No. 907 of 2002		Bayong Raw Water
			Clean Water	Drinking Water	
A	**PHYSICS**				
1	Smell				Odorless
2	TDS	mg/ liter	1500	1000	105
3	Turbidity	NTU	25	5	0.02
4	Temperature	C	30	30	27.6
5	Color	TCU	50	15	0.03
B	**CHEMISTRY**				
1	Iron	mg/ liter	1	0.3	0.26
2	Fluoride	mg/ liter	1.5	1.5	0.56
3	Hardness	mg/ liter	500	500	74
4	Chloride	mg/ liter	600	250	40
5	Chromiumval 6	mg/ liter	0.05	0.05	0
6	Manganese	mg/ liter	0.5	0.1	0
7	Nitrite - N	mg/ liter	1	1	0.01
8	pH		6.5 - 9	6.5 - 8.5	7.3
9	Cyanide	mg/ liter	0.1	0.1	0
10	Copper	mg/ liter	1	1	0
11	Chlorine residual	mg/ liter	0.5	0.5	0

According to the above table,it can be seen that the quality of raw water in Bayong village is very good for the consumption of clean water, even drinking water with the addition of chlorine to kill germs and bacteria.

For bottled drinking water production, the production capacity is 2000 liters. It takes 1 machine with a capacity of 2000 liters per hour. In one day with the machine's ability to work for 8 hours a day is capable of producing 16,000 liters per day. As a pilot project, this bottled water productis in the form of glass size of 240 ml so that in one day it can produce 288,000 cup of bottled water. Packagingmachine of Bottled Water is one without RO Machine with a capacity of 2.000 Liter/Hour with the following details:

a. 1 unit of bottled drinking water machine with a capacity of 2.500L / hour (20,000 GPD)
b. 3 units of Tank Filter with a diameter of 110x215cm
c. 1 unit of Ozone 2,500 l / h
d. 1unit of housing (ultraviolet lamp)
e. 1 set of pre filter machineconsisting of Silica Sand and Activited Carbon
f. 1 set of FT85Pumps
g. Reservoir
    1) 4 units of Stainless Steel reservoir with a capacity of 3000 Liter
    2) 4 units of plastic reservoir with a capacity of 3250Liter
h. Layout and piping
i. 1 unit of 2 line pneumatic cup sealer machine

Financial aspects

The investment fund for the manufacture of this drinking water plant is 1.5 billion rupiah, of which 700 million for construction of the building while the rest is to purchase Packaging Machine and start up capital for production with the following details:

Table 2 Summary of Investment Cost

DETAILS	**COSTS**
DIRECT COST	
Building Construction Cost	700.000.000
Machinery and Equipment Cost	
RO bottled drinking water machinewith a capacity of 2000 l/day	290,000,000
Laboratory equipment	50,000,000
Licensing	50,000,000
Goods Delivery	10,000,000
Van	200,000,000
Start up capital for production	50,000,000
INDIRECT COSTS	150,000,000
CAPITAL COST	**1,500,000,000**

To determine the feasibility of this strategy, we will calculate financial analysis of manufacturing of bottled water products using NPV, BCR, IRR, and BEPindicators. To calculate these four indicators,we first calculate the expected profit as shown in Table 3 below

Table. 3 Calculation of expected profit of bottled water business in Trenggalek

Detail	**1st year**	**2nd year**	**3rd year**	**4th year**	**5th year**
Capacity (cup 250 ml)	18,432,000	18,432,000	18,432,000	18,432,000	18,432,000
Sales Target	10%	20%	30%	40%	50%
Sales 250 ml)	1,843,200	3,686,400	5,529,600	7,372,800	9,216,000
Selling price	400	400	400	400	400
Sales value	737,280,000	1,474,560,000	2,211,840,000	2,949,120,000	3,686,400,000
Production Cost / cup	368,640,000	766,771,200	1,196,163,072	1,658,679,460	2,156,283,298
Employees	60000000	62400000	64896000	67491840	70191513.6
Depreciation	20300000	20300000	20300000	20300000	20300000
O &P Costs	7372800	14745600	22118400	29491200	36864000
Profit	**280,967,200**	**610,343,200**	**908,362,528**	**1,173,157,500**	**1,402,761,189**

Net Present Value (NPV)

Indicators of financial aspects used in assessing the feasibility of drinking water business consider the Net Present Value. Results value of PV of the overall desired profit of Rp 1,425,481,949.12, - is greater than zero hencethe investment proposal is accepted. Therefore, the Net Present Value is positive, the business plan is declared eligible to run. NPV value calculation is in accordance with Table 4

Table 4 Calculation of Net Present Value

Year	Profit	DF 12 %	PV Profit
1	280967200	0.8929	250875612.9
2	610343200	0.7972	486565599
3	908362528	0.7118	646572447.4
4	1173157500	0.6355	745541591.4
5	1402761189	0.5674	795926698.4
PV Profit			2925481949
Investment			1500000000
NPV			1425481949

Benefit Cost Ratio (BCR)

This indicator compares the number of the present value (PV) of overall present value with the present value (PV) of the entire investment.

BCR = Rp. 2.925.481.949/ Rp. 1425481949 = 1,95

Benefit Cost Ratio of investment whose value is greater than 1 (one), the investment is accepted in which the expected value of Benefit Cost Ratio is 1.95 means that the value is greater than 1, then the drinking water project of PDAM Trenggalek is declared acceptable or feasible.

Internal Rate of Return

IRR is the interest rate that will make the present value of the income expected to be accepted is equal to the present value of capital expenditure. Steps (a) calculate the PV of investment income using the interest rates which are 40%. (B) The results of these calculations are compared with the number of PV of the entire investment.

Table 5 Calculation of NPV at 40% DF

Year	Profit	DF 40 %	PV
1	280,967,200	0.71429	200,692,061
2	610,343,200	0.5102	311,397,101
3	908,362,528	0.36443	331,034,556
4	1,173,157,500	0.26031	305,384,629
5	1,402,761,189	0.18593	260,815,388
PV PROFIT			1,409,323,735
NPV			(90,676,265.33)

IRR is calculated by linear interpolation between the discount factor of 12% with NPV Rp 1,425,481,949 to DF 40% with NPV Rp (90,676,263) in order to obtain the value of IRR which is 33.64% greater than the MARR of 12%, then with this IRR indicator,the project is eligible to run

Break Event Point

Analysis of break-even point in the business of bottled water can be seen in Table 6, which occurred in the fourth year of BEP

Table 6 Calculation of breakeven point based on fixed rate system

Year	**DF 12 %**	Profit	PV Profit	PV lab kom	Investment	Net Cash flow
1	0.8929	280,967,200	250,875,613	250,875,613	1,500,000,000	-1,249,124,387
2	0.7972	610,343,200	486,565,599	737,441,212	1,500,000,000	-762,558,788
3	0.7118	908,362,528	646,572,447	1,384,013,659	1,500,000,000	-115,986,341
4	0.6355	1,173,157,500	745,541,591	2,129,555,251	1,500,000,000	629,555,251
5	0.5674	1,402,761,189	795,926,698	2,925,481,949	1,500,000,000	1,425,481,949

CONCLUSION

1. From the technical aspect, the source of raw water which is used for Bottled Drinking Water is very good in terms of quality and quantity
2. Bottled Drinking Water productswill be sold in 240 ml glass shape, with drinking water machine non RO with a capacity of 2000 liters / hour
3. Financial aspects indicate that the NPV value obtains Rp. 1,425,481,949, -. IRR obtains 33.64% greater than the commercial interest rate of 12%, while BCR is 1.95 greater than 1 and Break Event Point shows that the business payback can be achieved in the fourth year.

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HOW THE EFFECT OF ELECTROLYZED REDUCED WATER ON WISTAR RATS WITH CHRONIC PERIODONTITIS AGAINST THE LEVELS OF MDA

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ABSTRACT
Chronic periodontitis is an inflammation of the periodontal tissues with the highest prevalence in adult patients at the age above 35 years, but can also be found in children. Chronic periodontitis is associated with plaque and calculus, but in general the level of development of the disease is slow or medium speed and periodontal tissue destruction and alveolar bone can be observed. The predominant bacteria in chronic periodontitis is the Porphyromonas gingivalis (P. gingivalis). Electrolyzed Reduced Water (ERW) is water that is alkaline, ERW not only has a high pH and low of Oxidation Reduction Potential (ORP), but it also contains some magnesium ions. The magnesium ions proved to be effective for prevention of various diseases. To analyze the MDA level in Wistar rats with chronic periodontitis case that consume ERW. Wistar rats were divided into two groups, each group of 10 rats. In the first group is a group with chronic periodontitis and were consume with drinking water, the second group is a group with chronic periodontitis and were consume with electrolyzed Reduced Water. This experiment is done by calculating the levels of MDA. The calculation of the levels of MDA is done with Spectrophotometric Assay for MDA. The results of this experiment show that the level of MDA in serum in group that consume ERW had decreased significantly different with the group that consume drinking water with the statistical test. Based on the results, it can be concluded that ERW can decrease the MDA level ini Wistar rat with chronic periodontitis case.

Keywords: Chronic periodontitis, ERW, MDA level, Wistar rat

INTRODUCTION

Electrolysis of water produces reduced water at the cathode and oxidized water at the anode. Electrolyzed-reduced water (ERW) has an extremely negative oxidation-reduction potential. ERW is also termed alkaline electrolyzed water, alkali-ionic water, alkaline cathodic water, and alkaline ionized water, based on its physicochemical and physiological aspects. ERW exhibits an alkaline pH, is hydrogen molecule-rich, and has a negative oxidationereduction potential (ORP) and reactive oxygen species (ROS) scavenging activity (Park SK, 2013). Recently, electrolyzed-reduced water with high pH and significant negative redox potential (ORP) was shown to have SOD-like activity and catalase-like activity, and thus, scavenge active oxygen species and protect DNA from damage by oxygen radicals in vitro (Shirahata et.al, 2012).

Bioactivity of ERW is its antioxidant activity. ERW mimics the activity of antioxidant enzymes, such as SOD and CAT by scavenging ROS. Cellular oxidative damage to DNA, RNA, and protein molecules caused by ROS can be markedly opposed by ERW. Additionally, ERW has a therapeutic effect on various diseases, including diabetes, tumors, and renal disease. Reduced water exhibits high pH, low dissolved oxygen (DO), extremely high dissolved molecular hydrogen (DH), and extremely negative redox potential (RP) values.

Reduced water, as well as catalase and ascorbic acid, could directly scavenge H_2O_2. Reduced water suppresses single-strand breakage of DNA by active oxygen species produced by the Cu(II)-catalyzed oxidation of ascorbic acid in a dose-dependent manner, suggesting that reduced water can scavenge not only O_2 and H_2O_2 but also O_2 and OH (Park SK, 2013; Shirahata et.al, 2012).

Periodontitis can be further classified as chronic or aggressive. Chronic periodontitis usually has a slow to moderate rate of progression, with local and systemic factors such as plaque, calculus, smoking, and diabetes often contributing to the disease. Porphyromonas gingivalis, a Gram-negative anaerobe, has been frequently isolated from lesions in chronic periodontitis patients and is considered an etiological agent of the disease (Kobayasi et.al, 2006). The presence of inflammation of chronic periodontitis have resulted in an influx of immune cells use a lot of oxygen, causing excess production of reactive oxygen species (ROS) (Hendler et.al, 2010). Oxidative stress causes oxidative damage to lipids that can be detected by elevated levels of Malondialdehyde (MDA) in the cells (Zainuri M & Wanandi SI, 2012). In normal circumstances there is a balance between ROS generation and antioxidant activity in the cell (Bag A & Bag N, 2008; Harju et.al, 2004). If there is interference on the balance it will cause oxidative stress that can damage cell components. This research aims to study the role of ERW to MDA level which is one biomarker of their okidative stress on Wistar rats with chronic periodontitis.

MATERIALS AND METHODS

This study using Wistar rats as animals model. Twenty Wistar rats divided into two groups, ten Wistar rat as the first group was Wistar rats with chronic periodontitis that induced with Porphyromonas gingivalis bacteria and consume ERW (pH 8,5). Second group was ten Wistar rats with chronic periodontitis and consume with drinking water. MDA samples for examination were taken from Wistar rat blood. As much as 5 cc of blood drawn by using a syringe inserted into tubes that had contained EDTA, then centrifuged at 3500 rpm for 5 minutes. Liquid blood plasma that has been separated from the solid part of blood was transferred to MDA microplate for examination. MDA measurement is done using a kit MDA-586 BIOXYTECH on spectrophotometry

RESULT AND DISCUSSION

Table 1. Mean and standart deviation of MDA levels in Wistar rat with chronic periodontitis that consume ERW and drinking water

Group	Level of MDA (µM)	SD	Kolmogorof Smirnov	Anova	P
Control group (7 days)	0.591	0.032	0.644	0.193	0.000
ERW (7 days)	0.304	0.026	0.991		
Control group (14 days)	0.564	0.057	0.991		
ERW (14 days)	0.311	0.033	0.999		

The results showed a decrease in MDA levels of a group of Wistar rats with chronic periodontitis by ERW for 7 and 14 days than in the group given drinking water (Table 1) In table 1 shows significantly differences between the groups of Wistar rats with chronic periodontitis with ERW administration for 7 days and 14 days compared to the group with drinking water same at Figure 1.

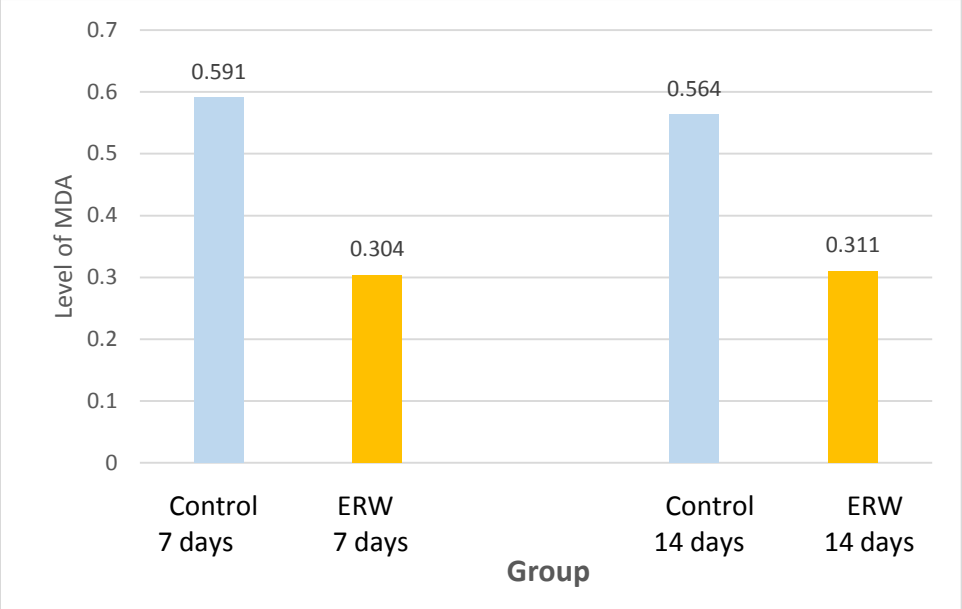

Figure 1. Mean number of MDA levels in Wistar rat

In the group of Wistar rats by administration of ERW decreased levels of MDA, it will show a decrease in ROS levels due in normal circumstances there is a balance between ROS generation and antioxidant activity in in cell. If the balance is disrupted will cause oxidative stress which can causing damage to the cell components. One of the damages caused by the condition Oxidative stress is a lipid peroxidation that will produce lipid peroxide. Lipid peroxide will decomposes to produce a number of compounds such as epoxides, hydrocarbons and aldehydes. Between aldehyde compounds produced were malondialdehyde (MDA) Some antioxidants endogenous that acts to prevent the occurrence of oxidative damage is the MnSOD, catalase and reduced glutathione (GSH) (Zainuri M & Wanandi SI, 2012; Bag A & Bag N, 2008; Harju et.al, 2004)

The decrease of MDA in groups of Wistar rats by administration of ERW at 7 and 14 days showed the role of ERW that have the potential of oxidation and reduction of low and high pH capable of eliminating reactive oxygen in cells and were able to cause damage to the plasmid DNA of bacteria, this situation is consistent with research on the Park et al in 2012 and 2013. Electrolysis of water produces reduced water at the cathode and oxidized water at the anode. Electrolyzed-reduced water (ERW) has an extremely negative oxidation-reduction

potential. ERW scavenges cellular reactive oxygen species (ROS) and suppresses single-strand breaks of plasmid DNA in bacteria (Park et.al, 2012).

CONCLUSION

From these research it can be concluded that the ERW administration for 7 days and 14 days resulted in decreased levels of MDA in blood of Wistar rats with chronic periodontitis.

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BIOBALL REACTOR DESIGN AS WASTE TREATMENT INSTALLATION IN CHILDBIRTH CLINIC

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ABSTRACT
Bioball reactor is designed as a wastewater treatment unit that is suitable for hospitals and birthing centers that operate without odor decomposing organic matter and producing sludge which is good for organic fertilizer while the processed water can be used for watering gardens. The superior aspect of the bioball reactor including the excellence in sedimentation tanks, where the flow of laminar down flow allows the sludge to settle by gravity. This unit has a flow barrier in the form of plates that resemble fish fins and are equipped with transparent pipes to control the sludge. Sludge will be issued through the output pipe into the tank filtration (filter) and then stored for watering the garden. This study aimed to test the design of the bioball reactor as a unit of wastewater process to a hospital or birthing center, and specifically analyze the differences of the values of BOD (Biochemical Oxygen Demand) and TSS (Total Suspended Solid), before and after the process, through the installation of bioball reactor, analyze the content of NPK (nutrition) sludge, and the physical and chemical parameters of the processed water. The method used in this research was "Field Experiment" by "One group pretest-posttest design". Fifteen samples were taken before and 15 samples after the process for each bioball reactor Type 1 (the thickness of bioball is 60 cm), Type 2 (the thickness of bioball is 70 cm) and Type 3 (the thickness of bioball is 80 cm), according to the sample size which was calculated by (t-1) (r-1) ≥ 15. where t = treatment, r = replication (3). Samples were taken after fulfilling conditions required residential time which was 6 hours and then sent to a laboratory for examination. Furthermore, laboratory results were tabulated and statistically analyzed using SPSS, with a standard error of 5%. The results showed that there were significant differences in the values of BOD and TSS before and after treatment using bioball reactor types 1, 2 and 3. The BOD value after treatment using bioball Reactor type 1 fell in the range of 24.3 to 37.7%, the type 2 dropped in the range of 56.3 to 63.2% and type 3 (fell in the range of 59.3 to 63.7%, but still higher (exceeding ..) than quality standards set by SK GUB No. 61/1999 (30 mg / L) TSS values after treatment using bioball reactor type 1 fell into around 25% -57, type 2 dropped in the range of 45.5 to 81.8% and type 3 fell into the range of 63.6 to 92.3%, Some treatment results with type 2 and type 3 proved to meet the quality standards set by SK Gub No. 61/1999 (at a level of 30 mg / L is counted as much as 73%) or 11 samples moved out from 15 tested-samples. NPK value of the sludge could not be determined and treated water had met the physical and chemical qualities as clean water. This study suggests to do experiment with a longer time so that the NPK value can be determined. Further research is needed by adding a disinfection process to elicit the infection risk from pathogens.

Keywords: Liquid waste, hospital, BOD and TSS

INTRODUCTION
The change of an environment as a result of an activity is known as environmental impact. The impact can be a positive impact in terms of benefits for the wider community and the negative impact in terms of environmental damage and further harm the publics. The positive and negative impacts are in the same integrated ecosystem between one with other components. One of the effects that must be considered is the result of a liquid waste produced from any activity in health care and one of them is on childbirth clinic services which must be planned the management.

The environmental management plan thus becomes one of the efforts that need to be implemented for the childbirth clinic in order to reduce the potential negative impact of the activities and ultimately strive for negative environmental impacts expected to occur can be prevented and controlled as minimum as possible. The existing environment impact after doing an environmental management efforts needs to be evaluated so that it can truly meet the applicable procedures, whether the provisions of the environment (Act No. 23 of 1997) or waste water quality standards of health care centers such as hospitals or birthing centers.

The law provision that rules the existence and activities of Childbirth Clinic and is associated with the implementation of environmental management plan (RKL), it is necessary to process the liquid waste from becoming a source of pollution that could eventually contaminate groundwater. One parameter of organic material is biochemical oxygen demand (BOD) and Chemical Oxygen Demand (COD) to the hospital or maternity clinic maximum of 30 mg / liter, while the average content of BOD's Hospital ranges from 60-500 mg / Liter.

The process of the liquid waste of Childbirth Clinic which is still used as one building similarly to a septic tank is necessary to search the best solution by taking into account the requirements of liquid waste before it is discharged. Currently, it is not in mind about a simple technology for treatment wastewater aerobically in Childbirth Clinic with a small ball acting as media in which the body consists of plates that can be used as a medium for bacterial growth (film formation) as well as to break down the organic material.

The principle of *contact aeration process*, with four (two) stages of treatment: 1) liquid waste is aerated for a certain time so that causing the decomposition of organic substances by suspended microorganisms, 2) liquid waste is pumped into the biofilter which already contains media from the plastic material (ball) which already contains biofilm, resulting in decomposition of organic substances second phase, 3) sedimentation / siltation (sludge) formed using a simple vertical column and 4) filtering with quartz sand.

Bioball reactor design as the liquid waste treatment installation of childbirth clinic designed by the researchers to function as decomposers of organic material, odorless, as well as generate sludge for organic fertilizer and processed water can be used as to watering garden. The excellences of bioball reactor design reactors are in the sedimentation tank with downflow so that the flow with laminar ones allow sludge settled in gravity by giving barriers in the form of slabs resemble fish fins and are equipped with transparent pipes as slurry control. Sludge will be existed on the position of the pipe into the tank effluent filtration (filter) which is later on accommodated for the purpose of watering the garden.

Table 1 is the results of the liquid waste examination at a hospital in Surabaya come from the whole process of all activities and the characteristics of the hospital’s waste shows that there are several parameters that exceed the standardized quality by the Decree of East Java Governor (SK) No. 61/1999, which is next conducted pre-trials.

Tabel 1 Characteristics of Liquid Waste Hospital in Surabaya before and after Bioball Reactor Testing in 2012

No	PARAMETER	Before	After	% Reduction
1	BOD, mg/L	353,33	176,67	50
2	COD, mg/L	615,01	369,01	40
3	Ammonia (NH3), mg/L	84,76	59,332	30
4	TSS, mg/L	119,26	47,704	60
5	Detergent (MBAS), mg/L	5,72	4,004	30
6	Phenol, mg/L	0,335	0,3015	10
7	pH	6,96	7,01	-

Based on the above background, it is interesting to test the liquid waste treatment system using a design Childbirth Clinic "Bioball Reactor" proposed to be patented as Intellectual Private Right (IPR) for the complete treatment (One Stop Waste Water Treatment). This experimental study design entitles "The Design and the Effectiveness of Bioball Reactor as Liquid Waste Process Installment in Childbirth Clinic".

Scope Of Problem

The variation of Bioball Reactor; 60 cm, 70 cm and 80 cm
Recidential times (TD) 6 hours.
Parameters of BOD and TSS liquid waste (before and after the treatments)
NPK Sludge/sludge
Physical and chemical parameters of clean water.

Research Questions

Are there differences in the levels of BOD and TSS before and after bioball reactor installation through various thickness of medium which are 60 cm, 70 cm and 80 cm on the residential times (TD) 6 hours?

The Objectives of Research

1. Main Objective
   Examining Bioball Reactor design as liquid waste treatment installment in hospital/childbirth clinic.
2. Specific Objectives
   a. Analyzing the levels of BOD and TSS after treatment process using bioball Reactor with a thickness of 60 cm, 70, and 80 cm.
   b. Testing the significance of differences in levels of BOD and TSS before and after installation bioball through the reactor with a thickness of 60 cm, 70 cm and 80 cm.
   c. Analyzing the content of NPK in the sludge in the settling tank.
   d. Analyzing the physical and chemical parameters of water treatment outcome.

The Outcome of Research

A set design of “Bioball Reactor" installation that has been scientifically examined through field experiments using the methodology and design "Before-After One Group Pretest-Posttest or design" in treatment liquid wastes in Health Center and Childbirth Clinic.

Hypothesis

Bioball Reactor Installation using Aerob System can decrease the levels of BOD and TSS

METHODOLOGY

Research Type

The study "Experiment Field" by design "One Group Before-after Test" or "Pretest-Posttest design" as follows:

O1…….X1……O1' : Treatment 1
O2…….X2……O2' : Treatment 2
On…….X1……On' : Treatment n

Test results BOD and TSS in wastewater before and after treatment in the laboratory examined and statistically analyzed for each treatment

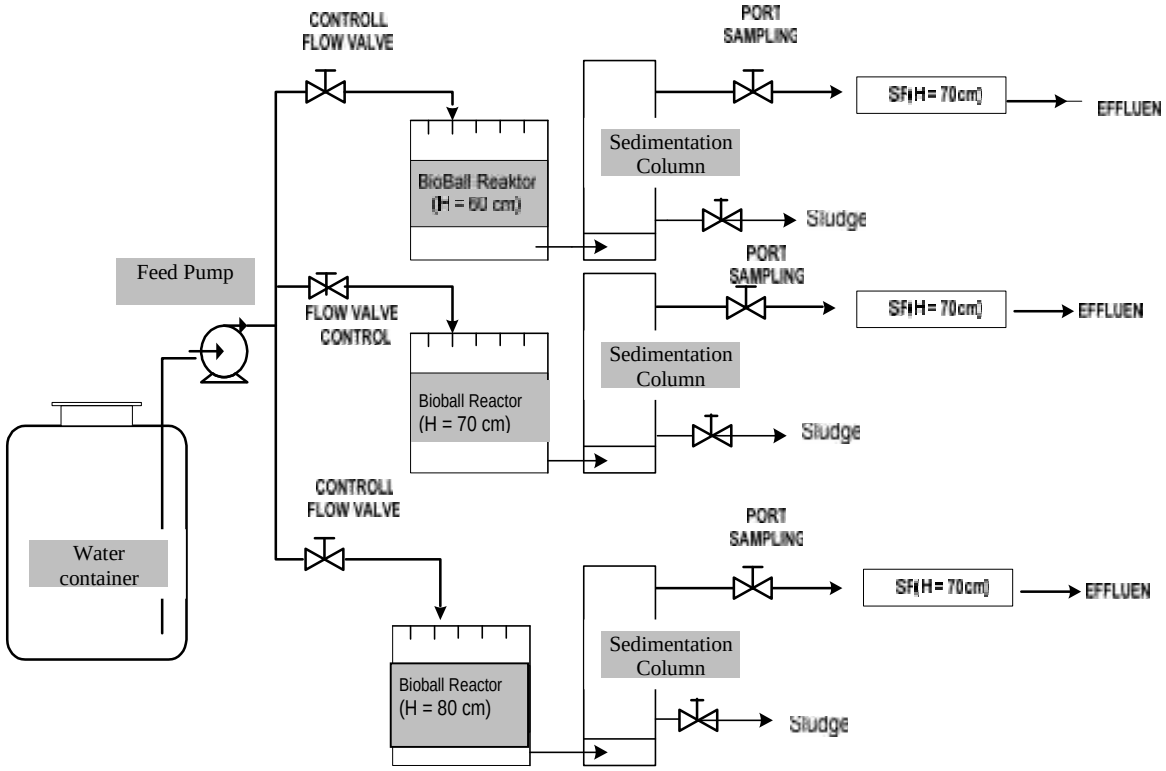

Figure 1. The Process of The Three Types' Liquid Waste Proccessing

Samples

The entire liquid waste produced every day by the hospital, except faces and water used for flushing which is in the tank. Further, samples were taken from the wastewater before entering the installation before and after treatment. The sample size was based the number of replication of the formula according to Hari Basuki (2006) on Sampling & Calculation of the samples.

$(t-1)(r-1) \geq 15$, $r-1 = 15$

Number of treatment 3 (3 mode) so that: $r \geq \{15: (3-1)\} + 1$ obtained a sample size (replication) or $r \geq 8.5$. In this research it was taken as many as 15 samples before and after treatment so that samples totaling 45 samples.

Data analysis

Arranged data in the form of tabulation is statistically analyzed to examine the difference between before and after treatments using SPSS with degrees of 95% or error rate (alpha) 5% (0.05).

RESULT

Total Suspended Solid (TSS) Liquid Waste

Table 2. The Results of the Examination of TSS level of Liquid Waste between Before and After Bioball Reactor Treatment Type 1,2, and 3 in 2012

No SAMPEL	BEFORE (mg/Ltr)	AFTER TREATMENT (mg/Ltr)					
		Type 1 Design Thickness 60 cm (% Reduction)		**Type 2 Design** Thickness70 cm (% Reduction)		**Type 3 Design** Thickness 80 cm (% Reduction)	
		content	% reduction	content	% reduction	content	% reduction
1	140	90	35.7	70	50	30	78.6
2	140	80	42.9	60	57.1	50	64.9
3	130	70	46.2	50	61.5	10	92.3
4	130	70	46.2	50	61.5	30	76.9
5	130	70	46.2	60	53.9	40	69.2
6	140	80	50	30	78.57	20	85.7
7	130	50	61.5	40	69.2	30	76.9
8	140	60	57.1	50	64.3	40	71.4
9	140	60	57.1	50	64.3	20	85.7
10	110	80	27.3	60	45.5	40	63.6
11	120	70	41.7	50	58.3	30	75
12	120	90	25	30	81.8	20	83.3
13	130	70	46.5	50	61.5	20	84.6
14	120	90	25	50	58.3	30	75
15	120	70	41.7	40	66.7	20	83.3
Kisaran	110 – 140	60 – 90	25 -57.1	30 – 70	45.5 – 81,8	10 – 50	63.6 – 92.3

Notes : Standart TSS = 30 mg/L (SK Gub. No.61/1999)

Based on the table, it is known that the decrease levels of TSS liquid waste after passing the Bioball Reactor installation for all types can be concluded that 1) the Bioball Reactor Type 1 (60 cm the thickness): The lowest decrease is 25% and the highest is 57.1%, 2) on bioball reactor type 2 (70 cm of the thickness): The lowest decrease is 63% and the highest is 92.3%, and 3) and in Bioball Reactor type 3 (80 cm of the thickness): the lowest decrease is 30% and the highest is 70%. The results of statistical test (Paired Samples Test) the three types show significant differences of TSS levels before and after treatments ($p = 0.00 < 0.05$).

BOD Liquid Waste Before and After the Treatments

Table 3 The Results of the Examination of BOD level of Liquid Waste between Before and After Bioball Reactor Treatment Type 1,2, and 3 in 2012

No SAMPEL	Before (mg/Ltr)	After Treatment (mg/Ltr)					
		Type 1 Design Thickness 60 cm (% Reduction)		**Type 2 Design** Thickness70 cm (% Reduction)		**Type 3 Design** Thickness 80 cm (% Reduction)	
		content	% reduction	content	% reduction	content	% reduction
1	239,97	149,53	37,7	88,69	63,0	87,91	63,4
2	239,97	149,41	37,7	88,61	63,1	87,53	63,5
3	239,97	149,46	37,7	88,72	63,0	87,44	63,6
4	239,97	149,38	37,7	88,49	63,1	87,22	63,7
5	239,53	148,86	64,0	88,14	63,2	87,03	63,7
6	235,88	148,52	37,0	87,95	62,7	87,28	63,0
7	236,14	148,69	37,4	87,86	62,7	86,79	63,3
8	236,35	148,25	37,1	87,51	63,0	86,64	63,3
9	228,23	148,31	35,0	87,29	61,8	86,51	62,1
10	228,09	147,92	35,2	86,56	62,0	86,19	62,2
11	227,88	146,63	35,7	86,12	62,2	85,84	62,3
12	227,72	145,66	36,0	85,72	62,4	85,12	62,6
13	207,08	145,50	30,0	84,90	59,0	84,36	59,3
14	196,75	139,37	29,2	82,70	58,0	79,68	60
15	183,91	139,32	24,3	80,37	56,3	72,69	60,5
Kisaran	183,91 – 239,97	139,32 – 149,53	24,3 - 37,7	80,37 - 87,51	56,3 – 63,2	72,69 – 87,91	59,3 – 63,7

Notes : Standart BOD = 30 mg/L (SK Gub. No.61/1999)

Based on the table, it is known that the decrease levels of BOD liquid waste in Dr Sutomo Surabaya Hospital after passing the Bioball Reactor installation for all types can be concluded that: 1) the Bioball Reactor Type 1 (60 cm, the thickness): The lowest decrease and the highest are 24.3% and 37.7%, 2) on bioball Reactor type 2 (70 cm, the thickness): the lowest one is 56.3% and the highest one is 63.2%, and 3) on bioball Reactor type 3 (80 cm, the thickness): The lowest decrease is 59, 3% and the highest is 63.7%. The results of statistical test (Paired Samples Test) the three types show significant difference of TSS levels before and after treatment ($p = 0.00 < 0.05$).

NPK Sludge in Bioball Reactor Type 1,2 Dan 3

NPK sludge examination results cannot be implemented because of acclimatization and sampling time of 15 days has not resulted sludge. Media bioball Reactor is still in the process of forming the film as an indicator of the growth of microbes to decompose organic matter. Observations on the fin-shaped tank are visible sludge stuck and not fall in the bottom of the tank so that is not enough material to do a NPK analysis of sludge formed from this process as well as weaknesses in this study

Water Quality of The Treatment Results of *Bioball Reactor* Installation *Tipy 1,2 and 3* Physical Parameter

Tabel 4 Physical Parameter Examination Results Parameter Liquid Waste After treatment bioball Reactor Type 1, 2 and 3 in 2012

No.	Parameter	Unit	Max Limit	Result		
				Type 1	Type 2	Type 3
1	Odor	≠	≠ Odor	≠ Odor	≠ Odor	≠ Odor
2	Taste	≠	≠ Taste	≠ Taste	≠ Taste	≠ Taste
3	Temperature	°C	Air Temperature ± 30°C	28	28	28
4	Turbidity	NTU Scale	5	2,281	1,921	1,206

Notes : Examined parameters fulfill the minimum requirement of clean water chemically and relevant to Permenkes RI No. 416/MENKES/PER/IX/90

The results of the research shows that the results of the treatment meets the requirements of clean water so that it can be used as a source of water for the pool and garden watering.

Chemical parameter

Table 5 Result Of Chemical Parameter Liquit Waste of DR. Sutomo Hospital After Bioball Reactor Treatment

No.	Parameter	Unit	Max Limit	Result		
				Type 1	Type 2	Type 3
1	pH	≠	6,5 – 9,0	6,0	6,0	6,0
2	Nitrat	Mg/l	50	2,336	2,341	2,322
3	Nitrit	Mg/l	3	0,0055	0,0046	0,0052
4	Hardness	Mg/l	500	296,8	281,4	269,8
5	Chloride	Mg/l	250	64,27	63,85	62,66
6	TDS	Mg/l	500	587	485	328
7	Organic	Mg/l	10	16,15	16,15	16,36
8	Sulfate	Mg/l	400	16,244	14,712	12,928

Note : Examined parameters fulfill the minimum requirement of clean water chemically and relevant to Permenkes RI No. 416/MENKES/PER/IX/90.

The results of laboratory tests of water samples produced by wastewater treatment in Dr. Sutomo Surabaya Hospital (table 8) for chemical parameters except heavy metal has been qualified as clean water, so it can be used for watering the garden.

CONCLUSSIONS AND SUGGESTIONS

Conclusion

a. The content of TSS after the process using bioball Reactor type 1 (down around 25 - 57.1%), the type, 2 (down range from 45.5 - 81.8%) and type 3 (down range from 63.6 - 92.3%), and some of the results of treatment on bioball reactor type 2've found results that are eligible and the type 3 qualified quality standards.
b. The content of BOD after treatment using bioball Reactor type 1 (drops ranged from 24.3 to 37.7%), type, 2 (down ranged from 56.3 to 63.2%) and type 3 (down ranged from 59.3 to 63.7 %), and still exceeds the quality standards SK Gub. No. 61/1999 (30 mg / L).

c. There are significant differences content of BOD and TSS between before and after processes with Bioball Reactor.
d. NPK sludge by product treatment Bioball Reactor design still has not been formed so that cannot be analyzed as an organic fertilizer
e. The processed water Reactor design bioball qualified physics and chemistry (except heavy metals) as clean water and used to watering garden.

Suggestions

a. This study suggests that of experimenting with a longer time so that the NPK value can be determined.
b. Further research is needed to add a disinfection process to elicit the infection risk from pathogens.

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STUDY OF WATER QUALITY AND CARBON ABSORPTION BY PHYTOPLANKTON IN PENGASINAN LAKE DEPOK, WEST JAVA, INDONESIA

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ABSTRACT

Pengasinan Lake is located at Pengasinan Village, Sawangan District, Depok, West Java. The total area of Pengasinan Lake is ± 6 Ha. The functions of Pengasinan Lake are as a retention pond, water absorption area, recreation area, and irrigation for agriculture and fish pond. Phytoplankton is a parameter of water fertility and can be used to determine the rate of carbon absorption in the waters. The aims of the research are to analyze of water quality and compared with the water quality standard, analysis of abundance of phytoplankton, analysis the primary productivity and carbon absorption. This research was conducted from February until July 2016. The sampling of water and phytoplankton conducted on a 7 sampling point locations. Parameters BOD and COD were analyzed as indicators of water quality parameters. From the measurement results, shows that the BOD values ranged 3.12-17,. /l, COD from 23.59 to 82.59 mg/l that's means the values were exceeds the quality standards. The pollution in Pengasinan Lake comes from the activity around it. The pollution of water in Pengasinan Lake is caused by organic and inorganic wastes. The abundance of phytoplankton is 440,175 cel/l. The results of chlorophyll-a 4.12-7.04 mg C/m^3 and carbon which absorbed by phytoplankton are 1.37 x 10^9-2.35 x 10^9Ton/year or 210 x 10^3-359 x 10^3 Ton/m^3. Phytoplankton in lake plays an important role in absorbing of carbon. Abundance of phytoplankton are influenced by the quality of the water. Therefore, efforts to keep the situ from damage caused by pollution is needed. With the ability to absorb carbon by phytoplankton, the lake was very important to reduce global warming.

Keywords: water quality, abundance of phytoplankton, chlorophyll-a, carbon absorption

INTRODUCTION

Pangasinan lake is located in the Pengasinan Village, District of Sawangan Depok. Pangasinan Lake is one of the lake in Depok almost disappeared due to covering into housing by the developer. In 2003, Pangasinan Lake revitalized and spacious defined as an area of 6.5 hectares and there should not be any permanent buildings. Pengasinan Lake has a depth of 1-4 m. The Pengasinan Lake have a function as a water catchment area, irrigation for fish farmers and as a tourist destination. Pangasinan Lake managed by the lake working group to conservation and utilization. Lake working group consists of the communities around it and other stakeholders. This working group under the guidance of Depok City government especially the natural resources conservation bureau of the Environment Agency in Depok.

The activities around Pengasinan Lake can cause problems such as degradation of water quality and changes in the ecosystem balance. One way to monitor the water quality can be done by using of phytoplankton as an indicator.

In the context of global warming, the lake serves as a regulator of the micro-climate where ecological processes in the lake is very helpful in reducing air heating.

Phytoplankton are contained in the lake serves as a carbon sink in the air used in the process of photosynthesis and oxygen that is formed is released back into the air. In addition, the dynamic waters of the lake is quite efficient in the sinking of the organic carbon in the sediments. Based on the mass balance approach, it can be calculated Balance Carbon (Carbon Budget) in the waters of the lake. Thus, the existence of the Pengasinan Lake need to be considered and managed in a sustainable.

The research aims to analyze of water quality and compared with the water quality standard, analysis of abundance of phytoplankton, analysis the primary productivity and carbon absorption.

METHOD

This research was conducted from February until July 2016. Sampling was conducted 4 times that in April, May, June and July.

The sampling of water and phytoplankton conducted on a 7 sampling point locations. Determination of sampling points in terms of the Indonesian National Standard (SNI) 6989.57: 2008 regarding the method of sampling of surface water, are:

a) A natural water source, ie at the location that has not or a bit pollution.
b) Sources of contaminated water, are the location that has received the waste.
c) Water sources used, ie at the location where the intercepts of water resources.
d) Location entry of water into the reservoir or lake.

Determination of sampling sites in Pengasinan Lake based on the characteristics and surrounding activities. Sampling points shown in Table 1 and Figure 1 below.

Sampling point	Coordinat	Explanation
1	6° 25' 27.300" SL 106° 45' 0.640" EL	Southern part of the lake, there is a floating restaurant and pond fish farming
2	6° 25' 24.460" SL 106°44'55.370" EL	Influenced by the inlet from the the residential area of drainage channels
3	6° 25' 22.030" SL 106° 44' 53.260" EL	Influenced by the inlet from the Kali Angke
4	6° 25' 18.310" SL 106° 44' 53.890" EL	Influenced by the inlet from the housing residents, fish ponds, and stalls
5	6° 25' 16.094" SL 106° 44' 56.118" EL	Recreation zone
6	6° 25' 13.239" SL 106° 44' 58.345" ET	Waters towards the outlet which is end of area in Pengasinan Lake
7	6° 25' 12.350" SL 106° 44' 58.942" ET	*Outlet*

To determine of the water quality Pangasinan Lake, conducted some physical and chemical parameters are shown in Table 1. The data were compared and analyzed with the quality standard by the Indonesian Government Regulation No.82 of 2001 regarding Management of Water Quality and Water Pollution Control, Group III (water allocation can be used for freshwater fish farming, animal husbandry, water to irrigate crops, and or allotment another requires the same water with these purposes).

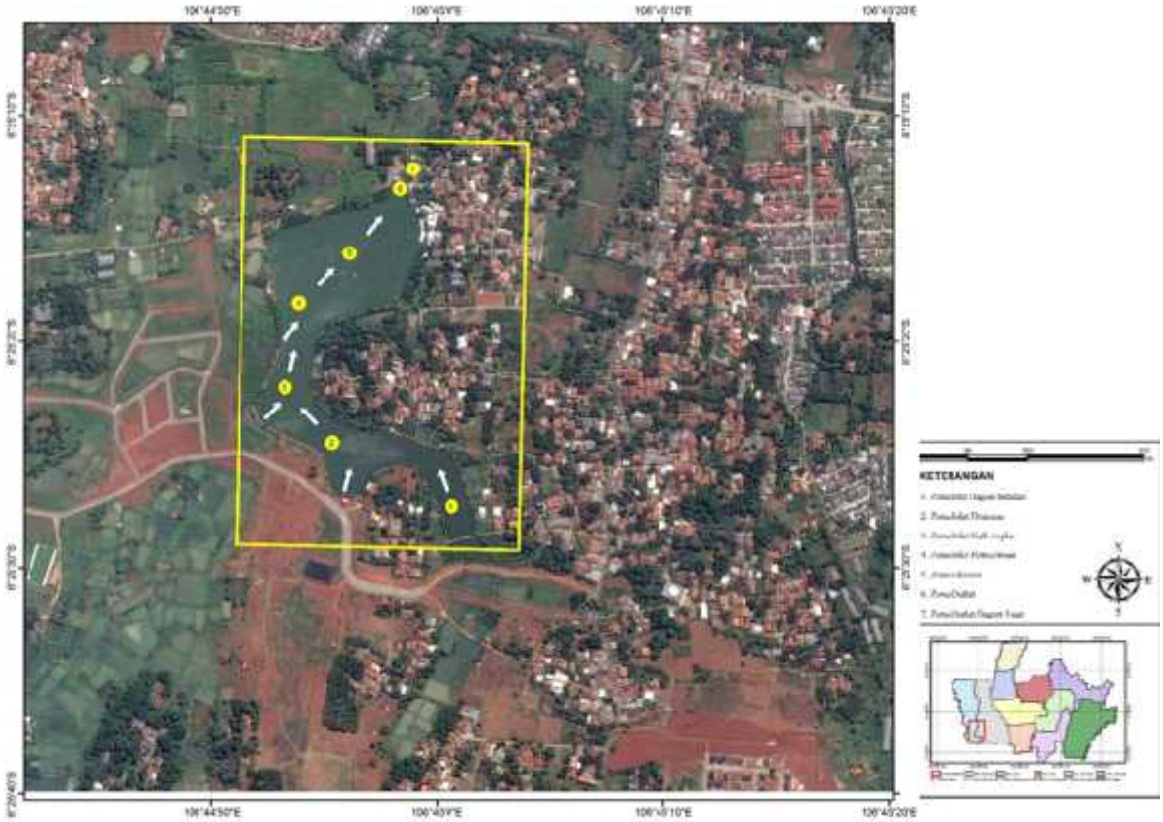

Figure 1 Sampling point at Pengasingan Lake

Table 2 The measured parameters, tools and method

Parameter	Unit	Tool/Methode
Temperatur	°C	Thermometer
Brightness	cm	Visual
Turbidity	NTU	Turbidimeter
pH	-	Elektrometric methode
DO	mg/l	Winkler
COD	mg/l	Titration
BOD	mg/l	Winkler
Nitrat	mg/l	Spectrophotometri
Phosphat	mg/l	Spectrophotometri

The determination of the abundance of phytoplankton carried out by the method wash over glass objects Sedgwick Rafter Counting Cell (American Public Health Assocition, 1983) with a set of cells per liter (cells/l) with the equation:

$$N = \frac{X}{Y} \; x \; \frac{1}{V} \; x \; Z \qquad \text{.....1}$$

Where:
N = abundance of phytoplankton (cells / l)
X = volume of filtered water (250 ml)
Y = Volume 1 drop (0.05 ml)
V = Volume of filtered water (100 liters)
Z = Number of individuals (cell)

Calculation of chlorophyll-a is done by using the following formula (APHA, 1992).

$$Klorofil - a\left({}^{mg}/_{m^3}\right) = \frac{[(11{,}85 \times E_{664}) - (1{,}54 \times E_{647}) - (0{,}08 \times E_{630})] \times V_e}{V_s} \quad \ldots\ldots\ldots\ldots\ldots\ldots 2$$

Where:
E664 = absorbance of 664 - 750 nm absorbance
E647 = absorbance of 647 - 750 nm absorbance
E630 = absorbance of 630 - 750 nm absorbance
Ve = acetone extract volume (ml)
Vs = volume of sample filtered (250 ml)

Having in mind the value of chlorophyll-a it can be seen fertility the water.

Table 3 Trophic Status of Water Classification

Parameter	Trophic Status			Source
	Eutrophic	Mesotrophic	Oligotrophic	
Brightness (m)	3 – 1,5	6-3	> 6	Wetzel (2001)
Nitrat (mg/l)	>0,2	0,1-0,2	<0,1	Golman and Horne (1983)
Phosphat (mg/l)	0,031 – 0,1	0,011 – 0,03	0,003-0,01	Vollenweider in Effendi (2003)
Klorofil-a (mg/m^{-3})	10-500	2-15	0,3-3	Jorgensen (1990)
Abundance of phtoplankton (ind/l)	> 15.000	2.000-15.000	< 2.000	Lander in Basmi (1999)

With the content of chlorophyll-a in phytoplankton are used to determine the amount of carbon that is absorbed by phytoplankton in the water. Brightness affects the viability of phytoplankton, so the depth measurement is based on the depth of the brightness measured using a Secchi disk. Carbon uptake can be calculated based on the volume. Total carbon absorption can be calculated by the following equation:

$$Value\ of\ clorophil - a\ (mg/m^3) \times mol\ CO_2 = mgCO_2/m^3$$

$$mgCO_2/m^3 \times \frac{12}{44}(Ar\ C/CO_2) \rightarrow mgC/m^3 * \quad \ldots\ldots\ldots\ldots 3$$

* Converting mg/m^3 to ton/m^3 and ton/year to determine the ability of carbon absorption in the water and the amount carbon absorption in a certain time period.

RESULT AND DISCUSSION

Figure 2 below shows the water quality of Pengasinan Lake. From the pictures shows that BOD, COD and phosphate were exceed the quality standards. Activities around the lake such as gardens, stalls, garbage and settlements contribute to the pollution that goes into the lake.

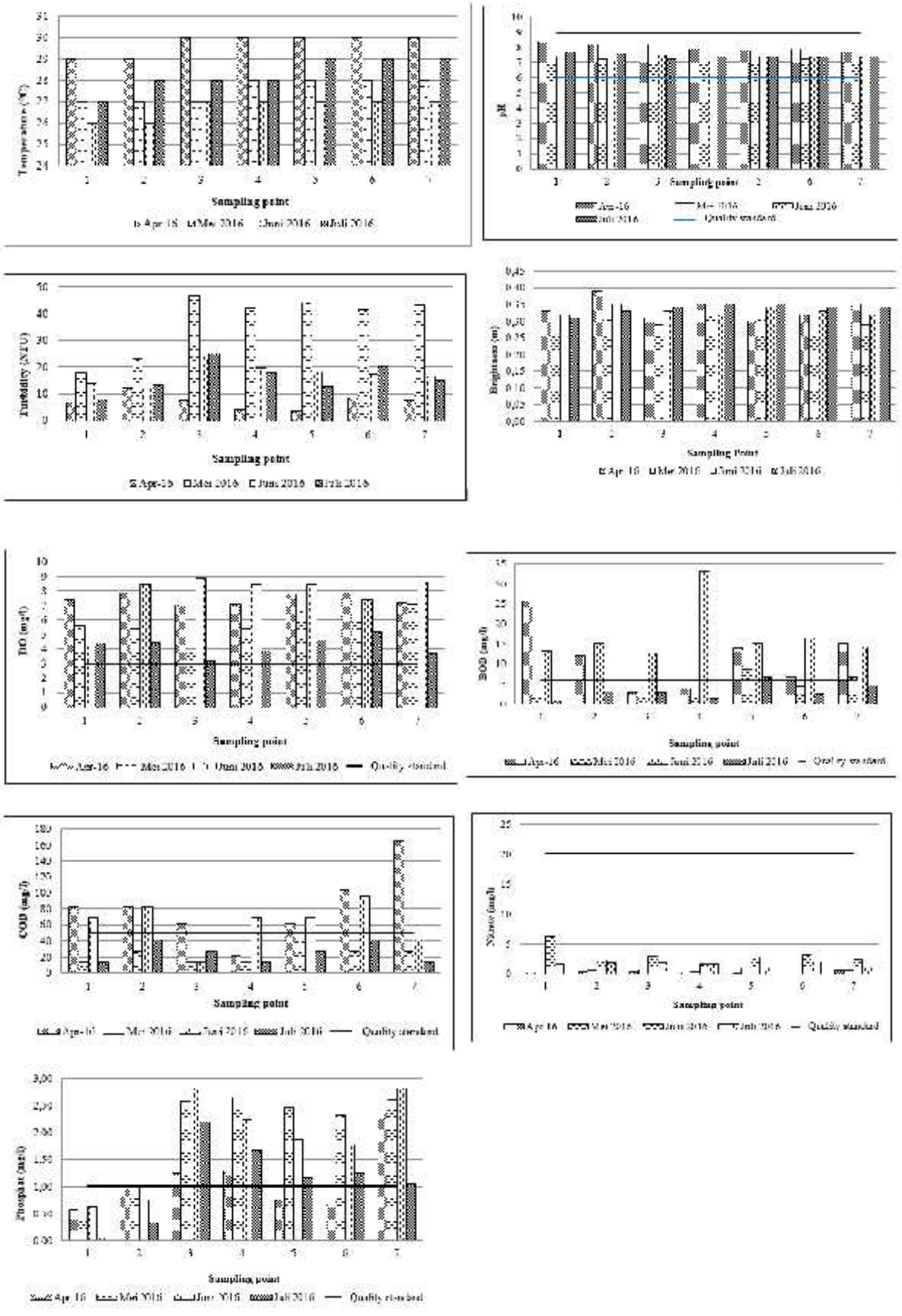

Figure 2 Water Quality of Pengasinan Lake

Waste water which enter into the lake in the form of gray water. Activities that surround the lake, has not made its waste water treatment. Phosphate exceeded the quality standard is estimated to come from detergents degraded. Organic materials that go into the water serves as a source of nutrients. Organic material is degraded by microorganisms become essential compounds like NO_3 and PO_4 which can be used by phytoplankton for growth. Phosphates which changes to orthophosphate would be absorbed by phytoplankton. The transformation process that occurred was influenced by a-biotic environmental factors such as sunlight, air, media and biotic factors such as microbes and phytoplankton. Degradation is supported by a sufficient oxygen content in the water. The oxygen content in Pengasinan Lake more than 3 mg/l. In addition to the brightness of 0.3 m, the process of photosynthesis performed by phytoplankton by using sunlight can take place optimally.

The range of pH values are ideal for the life of phytoplankton in the water is between 6.5 to 8.5 (Romimohtarto, 2004). Pengasinan Lake pH ranged from 7.31 to 8.01. Nitrate (NO_3) is the main form of nitrogen in natural waters and is a source of nutrition for the growth of phytoplankton. Nitrate (NO_3) levels exceeded 0.2 mg/liter can resulted of eutrophication (Effendi, 2003). NO_3 in Pengasinan Lake ranged from 0.27 to 3.13 mg/l. Yoshimoro in Wardoyo (1982) stated that the phosphorus content in waters> 0,201 extremely fertile. Phosphates in Pengasinan Lake ranged from 1.10 to 2.01 mg/l.

An abundance of phytoplankton community in waters highly related to biotic and abiotic factors. The nutrients can affect the abundance of phytoplankton and phytoplankton densities can otherwise degrade the nutrients in the water. Changes in the composition of phytoplankton may influence the composition of zooplankton and plankton community overall in an ecosystem (Pugesehan, 2010). Kocer (2014) says that the effect of temperature, pH, dissolved solids, nitrate, and silica on the abundance and distribution of phytoplankton. The generalized linear model revealed that high pH and high dissolved solids content seemed to affect the abundance of phytoplankton via limiting nutrient availability. Meteorological conditions play a major role in the dynamic of aquatic systems. The temporal cyclic patterns of phytoplankton composition are well-known in temperate regions, where temperature, stratification, light, and nutrients availability exhibit recurrent seasonal dynamics (Sommer et al. 1986; Grover and Chrzanowski 2006 in Figueredo and Giani, 2009).

Table 4 Phytoplankton abundance in Pengasinan Lake

Sampling point	Abundance (cell/l)			
	April	Mei	June	July
1	20,100	2,100	3,900	3,750
2	354,600	4,750	4,450	17,500
3	450,750	7,900	5,750	4,800
4	270,800	7,100	3,600	2,600
5	127,250	7,050	2,650	2,750
6	93,850	7,300	3,050	2,350
7	10,950	9,000	2,600	3,150
Total	1.328.300	45.200	26.000	36.900

Higher the abundance of phytoplankton in the area around the inlet than the other sampling points because in this area is a source of the inlet that brings a lot of nutrients. Nutrient source derived from agricultural activities and plantations that contain N and P, and therefore contributes to the growth of phytoplankton. In addition, supported by environmental conditions favorable for the growth of phytoplankton, where the water

temperature of 30 ° C. The temperature range is in accordance with the statement (Effendi, 2003) temperature range optimum for the growth of phytoplankton in waters ranging between 20 °C - 30 °C and by Boney (1982) that most of phytoplankton freshwater shall grow at temperatures between 25ºC - 30ºC. The brightness at the sampling point is 0.31 m and 7.64 NTU turbidity value. Turbidity greatly affect the abundance of phytoplankton, because it can affect the intensity of the light that enters the waters so that it will affect the photosynthesis of phytoplankton.

According Rimper in Yaserli, et al. (2013), the abundance of phytoplankton divided into 3 groups of phytoplankton, low, medium and high. Low abundance ranges <12,000 cells / l, was 12,500 cells / l and high phytoplankton abundance of> 17,000 cells / l. The number of species and abundance of varied influences diversity index. From these statements, it can be said that for 4 times the sampling Pengasinan Lake have high phytoplankton abundance, around 2100 cells/l – 450,750 cells/l. Meanwhile, based on the classification of trophic status Lander in Exterminate (1999), the value of the abundance of phytoplankton Pengasinan Lake > 15000 cells/l, classified as an eutrophic water or nutrient-rich water.

Chlorophyll-a is the most commonly pigment contained in phytoplankton that the concentration of phytoplankton is often expressed in the concentration of chlorophyll-a (Parsons et al., 1984). The concentration of chlorophyll-a in the waters is highly dependent on the availability of nutrients and sunlight intensity. According Tubalawony (2007), when the nutrients and the intensity of sunlight is available, then the concentration of chlorophyll-a will be high and conversely. The high content of chlorophyll-a phytoplankton in the waters not always as good conditions for water. The content of chlorophyll-a high in the waters indicated the occurrence of eutrophication. The influence of nutrients that are uncontrolled will disrupt aquatic ecosystems. From an average of 4 times the sampling, chlorophyll-a in Pengasinan Lake range from 3.19 mg/m^3 - 38.81 mg/m^3. According to the criteria of Jorgensen (1990), the value is included in eutrophic waters or waters with high fertility.

In the process of photosynthesis by phytoplankton, the absorption and decomposition of carbon dioxide occurs (Wong, 1982, in Darussalam et al., 2008). So phytoplankton can be utilized optimally to reduce CO_2 emissions. The rate of carbon in Pengasinan Lake can be seen in Table 5.

Carbon absorption in Pengasinan Lake ranges from 1.37×10^9 to 2.35×10^9 ton/year or 210×10^3-359×10^3Ton/m^3. The absorption of carbon is highest at the sampling point 3 that the around of inlet area and is directly proportional to the value of chlorophyll-a. The amount of chlorophyll-a in point 3 influenced by environmental conditions. Looking at the results of carbon absorption by phytoplankton hence the phytoplankton has an important role in reducing CO_2 emissions. Therefore lake as aquatic ecosystems must be managed properly. The Management measures must be conducted in Pengasinan Lake are reducing of sedimentation, reducing pollution and planting trees and ground cover plants around the lake area.

Table 5 The rate of carbon absorption in Pengasinan Lake

Sampling point	Value of chlorophyll-a		The rate of carbon absorption	
	mg/m^3	mgC/m^3	Ton/Year	Ton/m^3
1	15.10	4.12	1.37×10^9	210×10^3
2	12.12	6.16	2.05×10^9	314×10^3
3	25.24	7.04	2.35×10^9	359×10^3
4	18.58	5.91	1.97×10^9	301×10^3
5	16.59	4.49	1.50×10^9	229×10^3
6	14.83	6.87	2.29×10^9	350×10^3
7	21.52	5.87	1.96×10^9	299×10^3

CONCLUSION

1. BOD, COD and phosphate were exceed the quality standards. Organic materials that go into the water serves as a source of nutrients. Organic material is degraded by microorganisms become essential compounds like NO_3 and PO_4 which can be used by phytoplankton for growth. The oxygen content in Pengasinan Lake range 4.19-7.84 mg/l very supportive to degrade organic matter. Pengasinan Lake pH ranged from 7.31 to 8.01. The range of pH values are ideal for the life of phytoplankton. NO_3 in Pengasinan Lake ranged from 0.27 to 3.13 mg/l this condition describes of eutrophication. Phosphates in Pengasinan Lake ranged from 1.10 to 2.01 mg/l this condition describes of extremely fertile.
2. The abundance of phytoplankton in Pengasinan Lake ranges 2100 cells/l–450,750 cells/l. The value of the abundance of phytoplankton in Pengasinan Lake > 15000 cells/l, classified as eutrophic water or nutrient-rich water.
3. Chlorophyll-a in Pengasinan Lake range from 3.19 mg/m^3-38.81 mg/m^3. The value is included in eutrophic waters or waters with high fertility.
4. Carbon absorption in Pengasinan Lake ranges from 1.37×10^9 to 2.35×10^9 ton/year or 210×10^3-$359 \times 10^3 Ton/m^3$. Looking at the results of carbon absorption by phytoplankton hence the phytoplankton has an important role in absorption the CO_2. In the context of global warming, the lake is very helpful in reducing of CO_2 emissions.

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WILL PEOPLE LITTER WHEN THERE IS NO NORM ACTIVATION AROUND? A STUDY OF PERSONAL NORMS, ATTITUDE AND INTENTION

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ABSTRACT
Littering has been considered anti-social behaviors causing problems from personal level to environmental level. A lot of studies have been carried out to study littering focusing on the external power to control and regulate littering behavior. This study focuses on the internal and personal norm, independent of external power perceived. 333 students from Jakarta and Cirebon participated in the study by completing personal norms against littering questionnaire, anti-littering attitude questionnaire and intention not to litter scale. Gender and age range effect on the variables studied were analyzed using Multiple Group Analysis technique. The result shows that personal norms against littering predicted the occurrence of anti-littering attitude and indirectly predicted the intention not to litter. In line with classic attitude theory, anti-littering attitude predicted the intention not to litter. Gender and age range did not have differential power.

Keywords: littering, personal norms, attitude, intention, norm activation

INTRODUCTION

Littering is always problematic since it cannot be separated from human and environment activities. *The Guardian* (February 12, 2015) reported that Indonesia was among the worst 20 countries in the category of plastic waste management where 83% of waste added 0.48 to 1.29 m tonnes of marine plastic to the seas in 2010. Caldecott (2009) stated that the litter can affect the fundamental quality of life in society and also broadly cannot be ignored as impacting the economic, social and environments. Littering is considered as a form of comprehensive anti-social behavior, as well as one of the most important public problems (Caldecott, 2009), as well as unhealthy, and an eyesore / visual, environmentally damaging and costly to clean (de Kort, McCalley & Midden, 2008). This is due to a tremendous increase in the volume of waste both in us and in the village. Keeping public spaces clean is no longer easy, and littering becomes a symptom of individual and social attitudinal problems toward public space and garbage, while existing policies still seem difficult to overcome (Caldecott, 2009), and the problem was difficult to prevent (de Kort, McCalley & Midden 2008).

Recently, the Ministry of Environment and Forestry of Republic of Indonesia issued mistrial circulars no. s.1230/ in 17 February 2016. The awareness of waste management through ministerial regulations is one of pro-environment behaviors.

Problematic human aspects dealing with waste management as well as littering involve social norms regarding litter and littering. Research concerning with litter control had been documented in 1971 in which incentives given was able to reduce littering as long as the incentives followed the acts (Burgess, Clark, and Hendee, 1971). This result stimulated a review to research design in which antecedent strategies and consequence strategies were compared. Dwyer, Leeming, Cobern, Porter, & Jackson (1993) and Huffman, Grossnickle, Cope, & Huffman (1995) concluded that littering behavior was best predicted through antecedent strategies i.e. any factors inhibiting littering than consequence strategies i.e. the use of incentive.

Focusing on the antecedent strategies, this research emphasized the roles of social norms and individual attitude toward intention not to litter. Discussion about the term "norm" has been put into its predictive values over human behaviors (e.g., Berkowitz, 1972; Fishbein & Ajzen, 1975; McKirnan, 1980) and its ill-suited to empirical tests (e.g., Darley & Latané, 1970; Krebs, 1970; Krebs & Miller, 1985; Marini, 1984).In academic usage, Schaffer (1983) states that norms are actually dualistic in that the first referred to what is commonly done and the second deals with what is commonly approved or sanctioned (by default). Cialdini, Kallgren and Reno (1990) name those concepts as descriptive norms and the later injunctive norms. Descriptive norms process the information of doing something based on what is seen while injunctive norms emphasize on what ought to be done, resemble moral rules.

Kallgren, Reno,& Cialdini (2000) explain that norms affect human behavior systematically and significantly only when individuals perceive what norm is focal. This suggests that inherently individuals may have internalized the norm but require attention-focus procedures to guide prosocial behaviors. In their study, Cialdini et al. (1990) found that descriptive norm reduced littering only in clean environment. On the other hand, when in littered environment, the activated descriptive norm increased littering. In contrast to descriptive norm, injunctive norm had power to shift away any anti-social behavior into social consequences of such behavior.

Those social norms discussed above work with the involvement of external processes. Schwartz (1973, 1977) explains another norm, personal norm, which is driven by internal processes rather than by external processes. Personal norms are related to self-concept and obligation to perform action morally. Personal norms also help individuals to regulate their behaviors from within (Kallgren, Reno, Cialdini, 2000). Research in personal norms related with environment reveals that individuals with moral obligation to protect the environment are also more likely to show various pro-environment behaviors like higher intention to reduce personal car use (Nordlund and Garvill, 2003) and higher intention to use public transportation (Bamberg et al., 2007). In order to understand how human behaviors occur and change, it is best to understand the attitude toward the behaviors. Mostly two-thirds studies and publications dealing with human psychology and environment involve environmental attitude variable. However, the relationships between environmental attitude and behaviors have been moderate across studies (Hines, et al., 1986). The relationship between attitude and behavior has been an issue to be explored widely since it shows inconsistencies. Fishbein and Ajzen (2010) confirms the importance of behavioral intention preceding the actual behavior. Fihbein and Ajzen (2010) posit intention as mediating variable between attitude and behavior. In this research we assume that the more individuals feel moral obligation to protect environment from litters the more positive the attitude toward anti-littering is and the stronger the intention is.

Hypothesis 1: Personal norms against littering correlates positively with attitude toward anti-littering.

Related to littering, gender has roles in attitude toward littering. Women are reported more positive and stronger in their anti-littering attitude than men. Scottish survey found that women are more likely than men to think that littering is hard to comprehend (Keep Scotland Beautiful, 2007), women are likely to state that littering is hard to justify (Torgler, Garcia-Valinas, & Macintyre, 2008). US research on littering shows that men were less pro-social in their attitudes to littering than women (de Kort, McCalley, & Midden, 2008). We assume that gender will differentiate the role of personal norms against littering toward attitude toward anti-littering.

Hypothesis 2: The role of personal norms against littering toward attitude toward anti-littering and intention not to litter is differentiated by gender.
Keep America Beautiful reported that littering is carried out majorly by intention (81%) and commonly done by the age under 30. People under 15-year-old are less likely to litter and people begin to litter more after this period of age. From this finding we assume that age may differentiate the role of personal norms against littering toward attitude toward anti-littering.

Hypothesis 3: The role of personal norms against littering toward attitude toward anti-littering and intention not to litter is differentiated by age.

METHOD

This was a quantitative non-experimental research involving a total of 333 observations consisting of male participants (39%), female participants (61%), senior high school students (75.7%) and college students (24.3%). The participants completed 10 items of personal norm against littering adapted from Cialdini et al. (1990), attitude against littering and intention not to litter questionnaires which was developed in accordance with elicitation processes of TPB Questionnaire by Ajzen. The personal norm against littering questionnaire measured how much participants felt a personal obligation to desist from littering in any situations and conditions within 9 option response. Personal attitude against littering was measured in 7 response options in Thurstone scale resulted in positive or negative attitude toward littering. The qualitative aspects of evaluation were represented by the adjective scales in two separable components like *valuable --- worthless*, *pleasant --- unpleasant*, *enjoyable --- unenjoyable*, etc. Sample items of attitude scale was "To me, disposing trash / litter is…." The options were ranging from *valuable --- worthless* where the closer the response to *valuable* option the more positive the attitude vice versa.

From the observation, there was no explicit media / tools used to direct any pro-environment behavior in the research setting. This indicated that there was no activation agent for social norms to condition anti-littering behaviors in the setting of the research.

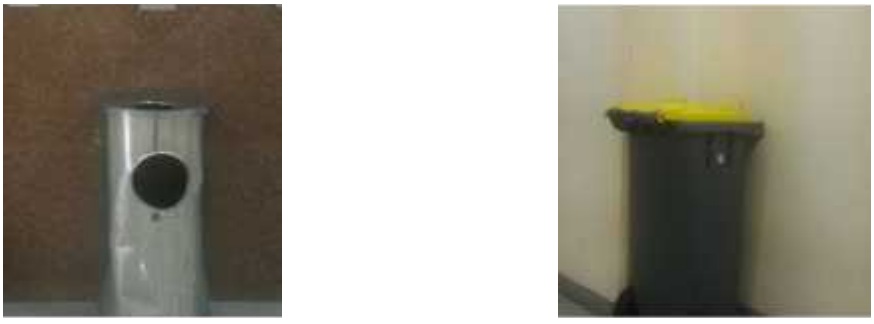

Fig. 1. Trash bin in the place of the study: no direction (*attention-focused*) to properly throw or put litter in the bin.

In order to test the effect of gender and age differences on the role of personal norm in anti-littering attitude formation and intention, *Multiple Group Analysis* (MGA) using SMARTPLS 3 (Ringle, et al., 2015) was performed.

RESULT AND DISCUSSION (HEADING 1)

Outer model test

The outer model test shows that the outer loadings of the items exceeds .06 which means, for explorative purpose, the items possesses good reliability indicators (Hulland, 1999). Table 1 sum up the distribution of constructs outer loadings.

Table 1. Constructs' Outer Loadings

Items	Anti-littering Personal norm outer loading	Anti-littering attitude outer loading	Intention not to litter outer loading
KuesB_1			0.945
KuesB_13		0.814	
KuesB_14		0.862	
KuesB_15		0.861	
KuesB_16		0.781	
KuesB_2			0.933
KuesD_1	0.741		
KuesD_2	0.763		
KuesD_3	0.721		
KuesD_4	0.751		
KuesD_5	0.672		
KuesD_6	0.744		
KuesD_8	0.635		

The model also shows good quality of Average Variance Extracted (AVE) of the constructs as indicated by values above 0.5 as well as high composite reliability 0.7 <. The following table shows the result.

Table 2. Construct Reliability and Validity

Measurement	Cronbach's Alpha	Rho A	Composite Reliability	Average Variance Extracted (AVE)
Anti-Littering Personal norm	0.845	0.848	0.882	0.518
Anti-littering attitude	0.850	0.856	0.899	0.689
Intention not to litter_	0.867	0.872	0.937	0.882

Inner model test

The inner model test showed that personal norm predicted the formation of anti-littering attitude (1.96 <T; p <0.05) and anti-littering attitude impacted the intention not to litter (1.96 <T; p <0.05)

Table 3. Inner Model Test

Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
-0.311	-0.328	0.053	5.880	0.000
-0.400	-0.411	0.066	6.100	0.000

Multiple Group Analysis

The multi-group analysis allows to test if pre-defined data groups have significant differences in their group-specific parameter estimates. From gender category, it was revealed that gender did not differentiate the impact of personal norm on the formation of

anti-littering attitude and anti-littering attitude on the intention not to litter, p>0.05. Table 4 displays the finding.

Table 4. Multiple Group Analysis Based on Gender Differences

TOTAL EFFECT	Total Effects-diff (| GROUP_Gender(1.0) - GROUP_Gender(2.0) |)	p-Value(GROUP_Gender(1.0) vs GROUP_Gender(2.0))
Anti Littering Injunctive norm -> Anti-littering attitude	0.107	0.126
Anti Littering Injunctive norm -> Intention not to litter_	0.051	0.220
Anti-littering attitude -> Intention not to litter_	0.311	0.997

From anti-littering program category, it was revealed that age did not differentiate the impact of personal norm on the formation of anti-littering attitude and intention, p<0.05. Table 5 displays the finding.

Table 5. Multiple Group Analysis Based on Age Range

TOTAL EFFECT	Total Effects-diff (| GROUP_Age(1.0) - GROUP_Age(2.0) |)	p-Value(GROUP_Age(1.0) vs GROUP_Age(2.0))
Anti-Littering Attitude -> Intention not to Litter	0.094	0.252
Personal Norm -> Anti-Littering Attitude	0.126	0.193
Personal Norm -> Intention not to Litter	0.077	0.825

CONCLUSIONS

This research shows consistent finding that people's intention is predicted from their attitude and personal norm. Regardless of the fact that there is no explicit anti-littering norm activation, personal norm works independently. In other words, personal norms really refer to internal standards concerning a particular action rather than reflecting external rules followed by sanction (Kallgren, et al.,2000). The decision or intention not to litter stems from internal moral standard rather than relying on what other people expect or what the rules say. Even though the anti-littering norm activation in the environment is absent, the regulation of personal norms on anti-littering still moves on and direct the attitude and intention not to litter.

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SIMULATION OF APPLICATION OF RECYCLED EXPANDED POLYSTYRENE BARRIER AS EARLY DETECTION OF COMMUNITY REACTION DUE TO NOISE ENVIRONMENT

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ABSTRACT
Background: Environmental noise is increasing with the growth of transport, so that exposure to noise received by the community increased. Barrier is one alternative solution in reducing noise. Determining the type of material to be used is not easy, especially in predicting the reduction of noise from its application. Objectives: This research aims to design an application that is able to predict noise reduction due to barrier installation and change of community's reaction due to environmental noise. Methods: The simulation was performed with three types of material (concrete, masonry brick and materials made from recycled Expanded Polystyrene (EPS), it called BATAFOAM) and conducted with 12 scenarios with barrier height variation and distance from the noise source to community. Results: The results showed that barrier's height is the significant parameters in noise reduction. Changes of distance the community to barrier is inversely proportional to the average noise reduction. The further distance the community to the noise barrier will reduce the average noise reduction. As the barrier of concrete and masonry brick, it has an average of noise reduction exactly like a BATAFOAM barrier simulation. Conclusion/Contribution to the Field: This application is simple to be used as tools in predicting noise levels and community's reaction with/without barrier in place in the community within certain of the source of the environmental noise.

Keywords: noise reduction, noise barrier, community reaction, noise environment, BATAFOAM

INTRODUCTION

Transportation systems is mainly the sources of outdoor noise worldwide (Arenas, Leiva, Vilches, & Cifuentes, 2013). The excessive noise exposure can cause health effects include an increased risk of cardiovascular disease, sleep disorders and threaten the community. Community's reaction due to noise environment began to appear on the noise levels of 62 dB and will cause vigorous of community action on noise levels over 72 dB (Barron, 2003).

According to South (2004), there are two strategic applicable to control outdoor noise are (1) increasing the distance between the source and the receiver, and (2) install a barrier that can effectively reduce the noise (South, 2004). In the open space, the sound will reduced with increasing distance from the sound source. Barrier is the main method that is applied to control noise at highway (Klingner, Busch-Vishniac, McNerney, Ho, & Peron, 1996). In addition to considering the safety factor, the ability in reducing noise is one of material's characteristic that should be considered. Various types of barrier material commonly used available in the market have the different ability to reduce noise. The common noise barrier material are concrete, masonry, wood, etc. In previous study in ecofriendly barrier material made from recycled Expanded Polystyrene (EPS), its called BATAFOAM, that the BATAFOAM's α were better than the concrete or masonry brick

(Nasri & Shofwati, 2015) and excellent ability to reduce the propagation of sound waves (Shofwati & Nasri, 2016). Thus BATAFOAM may be implemented to be an alternative noise barrier material due to its acoustic performance.

The purpose of this research to design an application that is able to predict noise reduction due to barrier installation and change of community's reaction due to environmental noise. It is necessary to facilitate in planning the construction of housing or highways and selecting the barrier material that has the ability to reduce noise better to be installed as a barrier and also predict the reaction of surrounding communities.

METHODS

The data that required in this application are (1) material's acoustic characteristic, either the sound absorption coefficient (α) and sound transmission loss (STL), (2) noise level in the community and (3) supporting barrier's datas, among others (a) barrier's height, (b) receiver's height, (c) noise source's height, (d) horizontal distance from the receiver to the noise barrier and (e) horizontal distance from the noise a vertical distance of the sound source to the top of the barrier, (b) the distance between the noise source to the barrier, (c) the distance between the community and barrier, (d) the distance the sound source to the top barrier and (e) within the receiver to the top of the barrier.

The indicators used to assess the effectiveness of this application are the changes in community reaction due to noise environment without/with the barriers in place and the reduction of the noise level which meet the requirement of community noise levels based on the Ministry of Environment No. 48 of 1996.

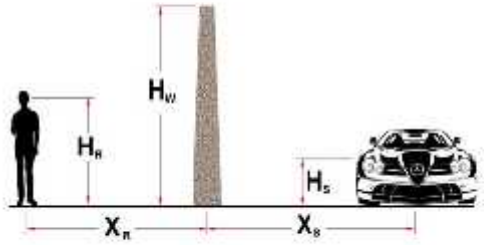
Barrier installation simulation carried out on various types of material commonly used as an outdoor barrier, with a variation of barrier's height up to 2 meters, 2.5 meters and 30 meters and a horizontal distance variation to the sound receiver barrier up to 10 meters, 15 meters, 20 meters and 25 meters. The horizontal distance from the noise source to the noise barrier is 20 meter and the receiver's height is 1.5 meters as an average Indonesian. The position of the vehicle's engine noise source is an average of 0.5 meters above the ground. Type of material selected in this simulation is concrete, brick walls and BATAFOAM.

RESULT

The design of the application of outdoor noise barrier in the prediction of the community reaction due to noise environment in the form of field data as in Figure 1. The simulation program will automatically calculate barrier's noise reduction at each frequency and the changes of community reaction due to noise environment with/without the barrier in place by looking at the color change at the output as shown in Figure 2.

NOISE BARRIER SIMULATION & COMMUNITY REACTION PREDICTION DUE TO NOISE ENVIRONMENT

ITING SHOFWATI & SJAHRUL MEIZAR NASRI



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BARRIER'S DATA DESIGN SIMULATION

H_W =	3.00	m	barrier's height
H_R =	1.50	m	receiver's height
H_S =	0.50	m	noise source's height
X_R =	25.00	m	horizontal distance from the receiver to the noise barrier
X_S =	20.00	m	horizontal distance from the noise barrier to the noise source
A =	20.16	m	distance from the noise source to the top of the barrier
B =	25.04	m	distance from the receiver to the top of the barrier
D =	45.00	m	distance from the noise source to the receiver
c =	347	m/s	sound velocity

BARRIER MATERIAL OPTIONS :

- ○ CONCRETE THICKNESS 200 mm
- ○ MASONRY BRICK THICKNESS 100 mm
- ◉ BATAFOAM THICKNESS 75 mm
- ○ LAMINATED GLASS THICKNESS 45 mm
- ○ WOOD BOARD 45 mm
- ○ OTHERS

RESULT OF NOISE LEVEL MEASUREMENT at EACH FREQUENCY (dB):

63	125	250	500	1000	2000	4000
112	116	110	106	106	100	95

TRANSMISSION LOSS OF OTHER BARRIER MATERIAL at EACH FREQUENCY (dB):

63	125	250	500	1000	2000	4000
55	56	55	54	50	45	40

Figure 1 the Field Data on Noise Barrier Simulation and Community Reaction Prediction Due to Noise Environment

NOISE BARRIER SIMULATION & COMMUNITY REACTION PREDICTION DUE TO NOISE ENVIRONMENT

ITING SHOFWATI & SJAHRUL MEIZAR NASRI

		Octave Band Center Frequency, Hz						
		63	125	250	500	1000	2000	4000
Lw, Noise Level	dB	112	116	110	106	106	100	95
TL, Transmission Loss	dB	51	49	52	55	56	53	55
Without the Barrier in Place:								
L_p^o	dB	68.04	72.04	66.04	62.04	62.04	56.04	51.04
Correction dBA		-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0
L_p^o Correction	dBA	41.8	55.9	57.4	58.8	62.0	57.2	52.0
L_{eq}	dBA				66.0			
With the Barrier in Place								
N		0.073	0.145	0.289	0.578	1.156	2.312	4.625
a_b		0.2415	0.1925	0.1337	0.0802	0.0430	0.0219	0.0110
a_f		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$-10Log_{10}(a_b+a_f)$		6.2	7.2	8.7	11.0	13.7	16.6	19.6
L_p	dB	61.86	64.86	57.30	51.08	48.37	39.43	31.43
L_p^o Correction	dBA	35.7	48.8	48.7	47.9	48.4	40.6	32.4
L_{eq}	dBA				54.7			
Noise Reduction	dB	6.17	7.15	8.74	10.96	13.66	16.60	19.60

< 62	62-67	67-72	>72 (X)
No Reaction	Complaints	Threat of Community Action	Vigorous of Community Action

Figure 2 Environment Noise Level with/without BATAFOAM as a Noise Barrier in Place and the Prediction of Community Reaction's Differentiate

Results from these studies showed noise reduction occurred by 11.3 dBA (66 dBA – 54.6 dBA) in the community closest to the highway, the noise level decreases with

increasing distance and can be ignored at a distance of 45 meters from the main road. These results be compared to the requirement of community noise levels based on regulation No. 48 of 1996, that noise level at the community after barrier installed acceptable <55 dBA (Ministry of Environment, 1996). Knauer et al (2000) said that barrier to be effective in reducing the environmental noise if it has the ability to reduce noise by 5 dBA (Knauer, Pedersen, Lee, & Fleming, 2000). Thus, The BATAFOAM is one of effective outdoor barrier material.

In addition to noise reduction of barrier's capabilities, it is necessary to predict effectiveness of outdoor barrier in terms of community's reaction. The noise generated from an activity to be expected, as it will contribute to the environmental noise so the impact on the community's reaction. Community's reaction changes can be observed in the colors changes that show the reaction of the community will be a certain noise level, where community's reaction began to appear on the noise levels of 62 dB and will cause vigorous of community action on noise levels over 72 dB. Results from these studies showed, for example at frequency 1000 Hz, noise reduction occurred by 13.66 dB (62.04 dB – 48.37 dB), which it will give rise to a complaint of most people (before noise barrier installed) to no community's reaction (after noise barrier installed).

Results from these studies showed generally the significance changes of community's reaction at each frequency and in total, so we can predict changes in the community's reaction to noise before and after installation of the barrier. Thus, planning the construction of housing or highways can predict the reaction of surrounding communities so that they can choose a barrier that has the ability to reduce noise better to be installed as a barrier between the noise source and the receiver noise. Noise barriers can reduce annoyance due to noise both indoor and outdoor and improve communication conversation (Nilsson & Berglund, 2006).

Environmental noise levels with barrier in place for several type of material barrier with BATAFOAM material, concrete and brick walls as shown in Figure 3. Results from these studies showed, the application of the barrier by using BATAFOAM, its made from recycled Expanded Polystyrene (EPS) have the same ability to reduce noise level than other materials (concrete and masonry brick) on a wide variety of high barrier to the noise source to the barrier distance of 20 meters. It is concluded that the changes distance the community to the noise barrier is inversely proportional to the average noise reduction. The further distance the community to the noise barrier will reduce the average noise reduction. Thus the application of the barrier BATAFOAM as able to help resolve two public health issues in noise pollution and not biodegradable waste.

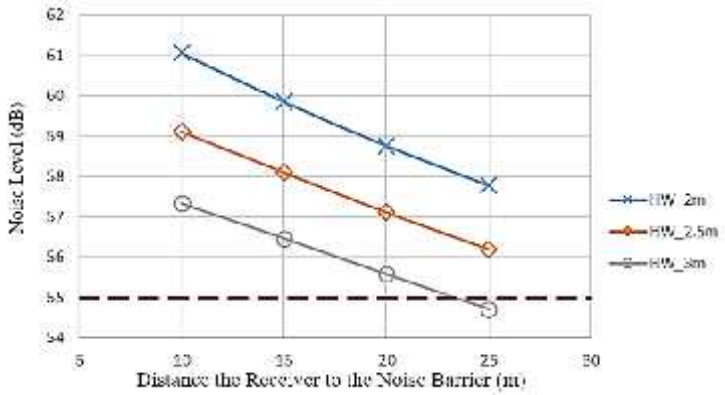

Figure 3 Environment Noise Level with the Noise Barrier in Place for Several of Distance the Receiver to the Noise Barrier (the distance from the noise source to the noise barrier is 20 meters)

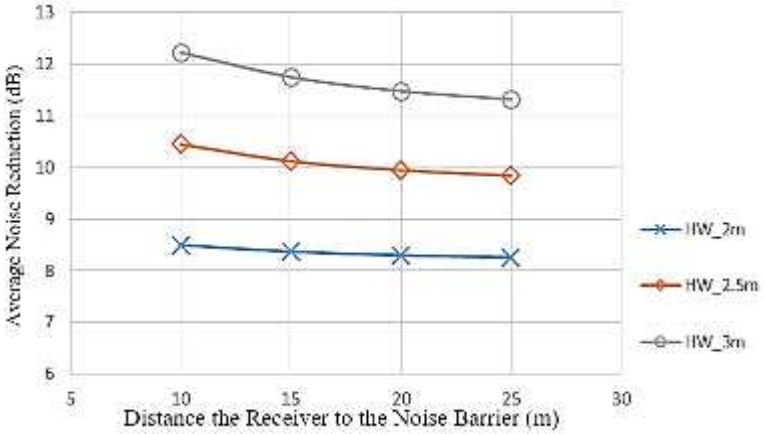

Figure 4 Average Noise Reduction of Barrier with Several of Distance the Receiver to the Noise Barrier (the distance from the noise source to the noise barrier is 20 meters)

Average noise reduction of barrier with various distance the receiver to the noise barrier and height of the barrier as shown in Figure 4. Results from these studies showed, either at a height barrier of 2 meters, 2.5 meters and 3 meters, it appears that the three material barrier have the same ability to reduce noise. The lowest barrier's height of the three material barrier, noise reduction occurred by 8 dBA more than 5 dBA. Thus, The BATAFOAM is one of effective outdoor barrier material.

Distance from the community to the noise source is indeed likely reduce noise. While the materials barrier, which is commonly used in building construction on the market, such as concrete and masonry brick, turns out to have the same noise reduction ability as BATAFOAM. Based on the previous study that the BATAFOAM have excellent ability to reduce the propagation of sound waves, that the value of BATAFOAM's Transmission Loss > 45 dB (Shofwati & Nasri, 2016). According Bendtsen (2010), normally the highest barrier's ability in reducing noise by 8-12 dB, it can be achieved by barrier material with a value of Transmission Loss 20-26 dB or more (Bendtsen, 2010). Thus BATAFOAM suitable for one ecofriendly alternative of outdoor barrier material.

In ideal conditions, distance from the community to the noise source, either from the factory, highway or other noise sources made as far as possible. In fact, the limited land in urban areas, it is difficult to design the distance from the community to the noise source because it requires relocate the community or the source of the noise. Results from these

studies showed barrier parameters that significantly reduce noise is a barrier's height as shown in Figure 4. Addition of barrier's height will increase in the average of noise reduction significantly. Thus, in the limited land in urban areas, acceptable noise reduction will achieved with higher barrier.

CONCLUSION

This application is simple to be used as tools in predicting noise levels and community's reaction with/without barrier in place in the community within certain of the source of the environmental noise. It also to be used to design with widely various barrier materials in the market and determine the minimum barrier height so that the noise level can be reduced according regulation of community's noise level.

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DENTIST'S WORKING POSTURE AND GLUCOSA LEVEL ON RISK OF MUSCULOSKELTAL DISORDER

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ABSTRACT
Introduction: Ergonomics good work is important so that workability, efficiency and a high level of clinical treatment can be maintained throughout the working life of a dentist. The success of the application ensures high productivity, avoid illness and injury, and improve satisfaction among dentist. On the other hand, the application of which is not suitable can cause musculoskeletal disorders related to work. MSD prevalence of dentists in the world is quite high, in India 78%, and Turkey reached 94%. The aim of the study was to determine the relationship between the dentist's working posture and levels of glucose on the risk of MSD among dentist in the Surabaya Health Center. Method: The study design was an analytical observational with cross sectional approach conducted at the working dentist, filled maxillary posterior teeth. The sampling technique was using cluster random sampling with sample number of 19 subjects. RULA method was used to analyzed working posture of the subject while MSD complaint were recorded using Nordic Body Map. Data are coded and entered into the tabulation prior to analysis using a statistical test to see the correlation. Basic statistics are calculated, including the prevalence rate. Results and discussion: There was a relationship between the glucose levels with Nordic Body Map with significant value p= 0.025. While the significant relationship between the Dentist't working posture and Nordic Body Map was p=0.012.

Keywords: Musculoskeletal disorders, Glucose, Position

INTRODUCTION

Musculoskeletal disorders (MSDs), which are problems of musculoskeletal system, are significant and costly workplace problems affecting occupational health, productivity and the careers of the working population. Musculoskeletal diseases, including pain, weakness and parasesthesia, are reported to be associated with wide range of occupations. Nearly 2 million workers suffer from musculoskeletal disorders each year. These problems are caused by repetitive, awkward, or stressful motions. Dental personnel had an increased risk of developing such disorders (Abduljabbar, 2000). Dentistry is a demanding profession involving high degree of concentration and precision. Dentists require good visual acuity, hearing, depth perception, psychomotor skills, manual dexterity, and ability to maintain occupational postures over long periods. Diminution of any of these abilities affects the practitioner's performance and productivity. Despite numerous advances in dentistry many occupational health problems still persist in modern dentistry [Muralidharan et al. 2013]. Musculoskeletal disorders is a disease that causes pain when the muscles receiving prolonged static load repeatedly and over a long time. One will experience symptoms ranging from mild to severe. How to work and working conditions strongly support the emergence of these musculoskeletal disorders, which can cause a damage to the muscles, nerves, tendons, joints, cartilage, and vertebral disc(Andayasari et al 2012).

The World Health Organization defines MSD as "a disorder of the muscles, tendons, joints, intervertebral discs, peripheral nerves and vascular system, not directly

resulting from an acute or instantaneous event but installing gradually and chronically". There are many types of factors responsible for MSD: occupational factors, medical factors (physical disorders, genetic predisposition, and age) and life style factors. Usually two or more factors trigger MSD. Work in dentistry is characterized by some body postures with different degrees of distortion. In this case the professional factors are represented by: prolonged static postures, repetitive movements, inadequate lighting, the excessive exertion of the small muscles, and the instrument tight grip, raised arms, static exertion of the muscles on long term, vibration (Anghel et al, 2007).

In the Decree of the Minister of Health no. 432, 2007 potential ergonomic hazards risk to health includes manual work (like lifting weights), awkward posture while doing the work, as well as repetitive tasks (repetitive). One of the causes of musculoskeletal syndrome with a dentist is a dentist only consider a comfortable position at the time of taking care of patients, but less attention to the consequences that would arise from an ergonomic position (Andayasari et al 2011).

The prevalence of musculoskeletal disorders in dentists in Saudi Arabia 82.9%. The reported prevalence studies in Australia reached 87.2%, India 78%, Lithuania 86.5%, and Turkey reached 94%. Based on the results of screening performed in FKG UI with instrument Discomfort Body Map and Brief Survey, found 80% suffered neck MSD mainly on the shoulders, forearms, hands, and back to the dentist who practices employment (Wijaya et al 2011). From the data shown high prevalence of musculoskeletal disorders in dentists. In the field of applied ergonomics in dentistry is a dentist working position to prevent musculoskeletal disorders. Musculoskeletal disorders can be avoided by raising awareness of posture during the work, redesigning the workspace to create a neutral position, examined the impact of instruments used in upper extremity pain, and follow sound practice to reduce work stress on the body dentists (Ivona et al 2014).

Proper ergonomic design is necessary to prevent repetitive strain injuries that can develop over time and can cause long-term disability (Gupta 20110). Tools and working environment, if not designed properly will cause inconvenience, inefficient, and ineffective. To obtain a way, attitudes, tools and working environment healthy and safe, is based on the ability, skill, and human limitations. With an ideal destination is set up such work is within the boundaries of where humans can tolerate, without causing abnormalities. Complaints of the musculoskeletal system is a complaint on the parts of skeletal muscle is perceived by someone from mild to very severe complaints. When the muscle receives static load repeatedly and for a long time, will be able to lead to complaints of damage to the joints, ligaments, and tendons (Tarwaka, 2015).

Glucose is the main product formed from the hydrolysis of complex carbohydrates in the digestive process and is a form of sugar that is normally found in the bloodstream. Excess blood glucose levels, especially after the absorption of food (carbohydrates). Excess glucose levels, through the mechanism of glikogenesis, stored in the liver and muscles as glycogen. The amount of glycogen that can be stored in the liver and muscle each about 5-8% and 1-3% by weight (^{10}. In the ergonomic working conditions can cause the body include the muscle fibers showed fatigue in prolonged submaximal work so as to cause a decrease in the glycogen reserves in the muscles. A decrease in the glycogen can lead to a weakening of contraction due to lack of sarcoplasmic reticulum Ca^{2+} (Silverthorn, 2014). These conditions can lower labor productivity, so please be aware of the risks posed to be given some alternative ways of solving problems.

With this, the researchers consider it necessary to do research related to glucose levels and working position with the working musculoskeletal complaints dental fillings

dentist in the clinic Surabaya.

METHOD

This research uses observational analytic study with cross sectional approach. The population in this study are dentists who treat patients with posterior maxillary dental fillings that are in Health Center (Puskesmas) of Surabaya. Sub-populations in this study include: a. Premenopausal; b. Not menstruating (time of blood sampling); c. Minimum term of 5 years; d. Physically and mentally healthy; e. Willing to be sampled in the study. The sample in this study is a dentist who meet the criteria selected using a sample size with cluster random sampling.

The variables in this study are: the independent variable is the glucose level and the working position, the dependent variable is musculoskeletal disorders. Instrument of research is Ergo Intelligence software, glucometers, digital camera, stationery. Processing and analysis of data using statistical tests.

RESULT

Tabel.1 Dentist't Working Posture and their Risk of Musculoskeletal Disorders Respondents On Health Center Of Surabaya 2016

Final Score (RULA)	Risk Category	Frequency	Percentage (%)
1-2	Low	0	0
3-4	moderate	3	15.8
5-6	High	7	36.8
7+	Very high	9	47.4
TOTAL		**19**	**100**

From the above table indicates that respondents with the highest frequency as much as 9 respondents (47.8%) with a final score of 7+ the very high risk category. It is necessary for an investigation and repairs as soon as possible at the working position the dentist when performing posterior maxillary dental fillings.

Table. 2 Analysis of Relationship Dentist Working Posture With Musculoskeletal Disorders Respondents On Health Center Of Surabaya 2016

Variables	Dependent variable	p	Information
Work position	Complaint	0, 012	There is a relationship

The above table shows that the value of significance between the working position with musculoskeletal complaints at 0.018. This shows that there is a significant relationship between the working position with musculoskeletal complaints.

Table 3 Overview of Respondents Glucose Levels In Dentist On Surabaya Health Center 2016

Category	Frequency	Percentage (%)
Low	1	5.3
Normal	18	94.7
High	0	0
TOTAL	**19**	**100**

Based on the above table shows that as many as 18 respondents (94.7%) have blood sugar levels in the normal category. Category normal with examination results

between 70 mg / dl to 200 mg / dl in the low category examination results obtained below 70 mg / dl, while in the high category examination results above 200 mg / dl.

Table 4 Mean and Standart Deviasi Glucose Levels and Musculoskeletal Disorders Respondents On Health Center Of Surabaya 2016

variable	n	Results Statistics Description Average Standard deviation
Glucose	19	107.79 ± 24.478
Complaint	19	19.63 ± 15.148

From the above table shows the results mean standard deviation of each variable studied.

Table 5 Relationship Analysis of Glucose Levels With Musculoskeletal Disorders Respondents On Health Center Of Surabaya 2016

variables	Dependent	p	Information
Glucose	Complaint	0,025	There is a relationship

The above table shows that the value of the significance of blood sugar (glucose) with musculoskeletal complaints by 0.025. This shows that there is a significant correlation of blood sugar levels (glucose) with musculoskeletal complaints.

DISCUSSION

In this study, method of Rula *(Rapid Upper Limb Assessment* technique*) wa*s used to asses Dentist's working posture to estimate the risk of disorders of the musculoskeletal systemure, especially on upper limb (Tarwaka,2015). The analysis using Rula's methods showed that most respondents received a score of seven (Silverthorn, 2014). This result can be interpreted that the Dentist's working posture on this study was on the area of a risk level three (3), which is a very high category. In this case, it means that something has to be done to reduce the risk musculoskeletal disorder among detist.

From statistical tests, it is indicated that based on Rula's method, level of Dentist's working posture taken from sampled respondent has mean of 6.00 ± 1.333. Results of the analysis showed that there is a relationship between a working position with musculoskeletal disorders (p = 0.012). This is because the majority of dentists in doing the patient using a standing position and bend in a long time repeatedly at the neck position is likely to come forward. Posture is one of the things that is most often associated with risk factors. Frequent or prolong bent over, bend, sit, stand too long or make a move on the part of the body is not ergonomic and can cause pain in the loin muscle. Bad posture while working withi long period of time may cause the load on the musculoskeletal system.

In a standing position with feet not aligned, the body tilted forward, the neck is too advanced and the seating position is strained, as tilted sideways, bend forward, neck tilted an initial response from risk factors to the employment relationship which can become a habit over time, Working with the arm away from the body, *overextended* and shoulders do not move normally and requires a higher muscle strength can increase the risk of injury. For the upper arms and shoulders, they are in relaxed neutral position with the shoulders parallel to the floor and in the same plane, arms at his side. Posture and positioning factors in the body, such as rotating your upper body, raise your shoulders, rotate / turn his head, lift the elbows can increase the

risk of symptoms of musculoskeletal complaints(Cahyanto,2009).

Recommendation of *the Occupational Safety and Health Administration* (OSHA) explained that the action ergonomics to prevent sources of the disease can be two ways, namely engineering (such as station design and work tools) and engineering management (such as the criteria and the organization of work). These preventive measures are intended to minimize and prevent *overexertion* their work attitude is not ergonomic. Ergonomic working attitude will accelerate muscle fatigue so that it will tend to be musculoskeletal disorders (Tarwaka. 2015).

Muscle only has the ability to contract and *relax* (relaxing). The analogy of the mechanism is as *pneumatic cylinder*, single activity with a spring system. Although virtually no spring in the human body. Muscles as the prime mover in the opposite direction to the other muscles known as antagonists movement that serves to control and restore the position of the hands and feet to the place of origin. In a slow and controlled movement, muscle both the prime mover and the antagonist are in a tense position *(tension)* during the movement. In a fast movement, automatically antagonist muscle *relaxes* (Wiradharma, 2012).

Adenosin triphosphate (ATP) is the biochemical way to store and use energy; bind myosin, allowing it to release actin and be in weak binding state (a lack of ATP make the this step impossible, resulting in the rigor state characteristic of rigor mortis); myosin then hydrolizes the ATP and uses the energy to move into the cocked back conformation. the molecular events of skeletal muscle contraction cycle, will start the first cycle of rigid conditions / rigor that is when the head of myosin binds tightly to actin-G molecule, no nucleotide (ATP or ADP), which binds to the myosin. Furthermore, an ATP molecule binds to the myosin head. ATP bond lowers the binding affinity of actin against myosin, actin and myosin in spite of. ATP binding place at the head of the myosin hydrolyzing ATP to ADP and remove one mole of organic phosphate. Power stroke will begin after Ca^{2+} binding to troponin and myosin binding open. At the end of Power stroke myosin release ADP which is a product of both ATP. With the loss of ADP, head back myosin binds tightly to actin in rigid conditions. To end the contraction of the calcium to be released from the cytosol, the sarcoplasmic reticulum calcium will be pumped back into the lumen using the Ca^{2+} - ATPase. By decreasing the concentration of free Ca^{2+} in the cytosol, the balance interference occurs between Ca^{2+} bound and free.

Calcium will be so regardless of troponin tropomyosin shifts back cover binding site for myosin on the actin. When bridges cross off, the muscle fibers relax with the help of elastic fibers in the sarcomere and supporting tissue in the muscle (Silverthorn, et al 2014). This situation can be evaluated by changing the working attitude that is not ergonomically ergonomics. Subjective complaints such as skeletal muscle disorders and fatigue can be reduced by improving work station and more ergonomic working attitude (Wiradharma, 2012).

Two forms of carbohydrate that the body uses as energy is blood glucose and muscle glycogen (Fox et al 1993). Glucose is a form of carbohydrate that is most important. Glucose is the carbohydrate in food is absorbed into the blood in large quantities and is converted in the liver (Mayes PA, 2000). Glucose is broken down in the body to provide energy to cells or tissue and can be stored as energy in the cell, as glycogen (Mayes PA,2004). Based on the analysis, the result $p < 0.05$, which means that there is a relationship between blood sugar levels with musculoskeletal disorders in dentists with p equal to 0.025. This is because the concentration of glucose in the blood plays an important role in energy metabolism[29]. Energy is needed for the physiological

processes that take place in the cells of the body. These processes include muscle contraction, formation and conduction of nerve impulses, secretion glands, the production of heat to maintain the temperature, active transport mechanism and a wide range of synthesis and degradation reactions (Widiyanto. 2008).

Glycolysis is one form of energy metabolism processes that can run anaerobically without the presence of oxygen. Glycolysis uses glucose deposits which will be largely derived from muscle glycogen or also of glucose present in the blood stream to generate ATP. Definition of glycolysis is is the process of solving one molecule of glucose into two molecules of pyruvic acid and occurs in the cytosol (cytoplasm) in anaerobic state. The amount of ATP that can be generated in the process of glycolysis will be different and depend on the origin of glucose molecules. If the glucose molecules derived from the blood of the two pieces of ATP will be generated, but if the glucose molecule derived from muscle glycogen then 3 pieces ATP will be produced (Purnomo, 2013).

The mechanism used in the regulation of blood glucose levels is very dependent on the presence of glycogen storage in the liver. If glucose levels are low, glycogen in the liver akann broken down into glucose through a process of glycogenolysis and then travels in the blood to be sent to the skeletal muscle and other organs that need it, and if high blood glucose levels, the glucose to be absorbed by the network with the help of the hormone insulin. The role of insulin and glycogen is a control system feedback to maintain normal blood glucose concentrations. When the concentration of blood glucose is high, then the resulting secretion of insulin, insulin will further reduce the concentration of blood glucose in order to return to its normal value. So that when the condition of respondents increased blood sugar levels can increase the risk of musculoskeletal disorders as well as conditions at the time the blood sugar levels decreased (Guyton,2006).

Rise and fall of blood sugar levels one of which is influenced by the hormone cortisol. The hormone cortisol can stimulate gluconeogenesis (the formation of protein and carbohydrate by some other substance) by the liver, increase the speed of gluconeogenesis by 6 to 10 fold. This situation is mainly due to two effects of cortisol (Guyton,2006). First, cortisol increases all the enzymes needed to convert amino acids to glucose in the liver cells. It is produced from the effects of glucocorticoids to activate transcription of DNA in the nuclei heart in a way similar to the function of aldosterone in the kidney tubule cells, accompanied by the formation of messenger RNA which can then be used to construct the enzymes needed in the process of gluconeogenesis. Second, cortisol causes the transport of the amino acids of extra hepatic tissues, especially of muscles as a result, a growing number of available amino acids in the plasma to enter the process of gluconeogenesis in the liver and therefore would increase the formation of glucose. One effect of increased gluconeogenesis is an increase in the amount of glycogen storage in the cells of the liver (Guyton,2006).

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CALLUS INDUCTION FROM LEAF EXPLANTS OF GENDARUSSA (*Justicia gendarussa* burm.f.) BY VARIOUS CONCENTRATION OF PLANT GROWTH REGULATORS (2,4-D, IBA AND BAP)

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ABSTRACT
To know the effects of plant growth regulators (2,4-D, IBA and BAP) on callus induction of gendarussa leaves.This research design using a factorial design with two factors (2,4-D and IBA: 0.5, 1, 1.5 mg/L and BAP: 0.5, 1, 1.5, 2 mg/L). There was 24 treatments and repeated 3 times. Observations carried out for 6 weeks. Time of callus formation, percentage of explants formed callus, and callus morphology data were analyzed descriptively. Wet and dry weight data were analyzed by Two-Way ANOVA ($\alpha = 0.5$). The results showed that various concentration of plant growth regulators (2,4-D, IBA and BAP) effected on callus induction from leaf explants of gendarussa. The most optimal treatment combination of concentration of plant growth regulators in inducing callus from leaf explants of gendarussa is D 1,5 B 2 (1.5 mg/L 2,4-D and 2 mg/L BAP) with a relatively long period of callus formation at the earliest, i.e. on day 5, 2,247 g wet and dry weight of 0.108 g, white callus translucent and textured friabel.

Keywords: Callus, Gendarusa (Justicia gendarussa Burm.f.), 2,4-D, IBA, BAP

INTRODUCTION

Gendarussa (*Justicia gendarussa* Burm.f.), a member of Acanthaceae, is a plant that has been used as a traditional medicine. Some of the benefits of gendarussa such as reduced migraine headaches, fever, hemiplegi, paralysis of facial muscles, swelling, ear pain, inflammation, bronchitis, dyspepsia, diseases of the eye, bleeding, muscle pain, antirheumatic, antinociception, antihepatotoxicity, malaria, and contraceptive in men (Chopra 1986; Thomas & Yoichiro 2010; Prajogo et al., 2007).

Various of research known that the gendarussa contains alkaloids, triterpenoids, tannins, justicin, steroids and flavonoids (Prajogo et al., 2007). The secondary metabolites of this plant can be utilized in various applications in medicines. Utilization of gendarussa massively in various drug applications faced with the problems given the availability of raw materials secondary metabolites in nature is very small amounts. If the content of the gendarussa is taken directly from the plant is often the quality is not in line with expectations and is not equal.

Gendarussa are a wild plant and not yet widely cultivated. During this time, gendarussa conventionally reproduced using cuttings and seeds. However, this conventional propagation has drawbacks including low multiplication rate and time-consuming, very low seed viability and require extensive land belonging to the planting of a sustainable (Thomas & Yoichiro, 2010). Therefore, it is necessary for the development of research that led to the search of effective and efficient method to meet the supply of useful secondary metabolites from gendarussa.

Plant tissue culture methods or in vitro culture can be used as alternative solutions to increase the productivity of crops, such as producing secondary metabolites in medicinal plants, propagation, and plant breeding (ISDA & Sulianyah, 2009; Kyte & Kleyn, 1996). Benefits of plant tissue culture can produced secondary metabolites with high economic value in a relatively fast, can take place continuously, quality is more consistent and

controlled and often the levels are higher than harvesting directly (Ariati et al., 2012; Sitorus et al., 2011). The success depends on the use of callus culture media base, a combination of plant growth regulators and environmental factors appropriate (George & Sherington, 1984). In addition, according to Evans & Sharp (1986) in Ajijah et al. (2010) the ability of each plant and plant tissue to form callus is not the same.

The factors that most affect plant growth in vitro are the interaction and balance between the supply of plant growth regulators endogenously and exogenously by cells cultured (George & Sherington, 1984). Without the addition of growth regulators in the media, very stunted growth may not even grow at all (Hendaryono & Wijayani, 1994). The use of growth regulators to consider is the type that is used, the combination and concentration. Plant growth regulators are widely used for callus induction is the combination of auxin and cytokinin (Zulkarnain, 2009). In addition, according to George & Sherrington (1984) callus induction dicotyledonous plants needed partnership combined growth regulator auxin and cytokinin.

Research on the callus induction from gendarussa leaf explants were investigated by Fadilah (2013) used a combination of growth regulators NAA, IAA, and BAP. On the results of the study showed gendarussa leaf explants successfully induced callus, but the callus growth tends to be slow, undergo browning (browning) and textured compact. While the use of a combination of growth regulators 2,4-D, IBA, and BAP has never been performed on callus induction from gendarussa leaf explants. The combination of concentration of different growth regulators can induce different responses. Therefore, this study was conducted to optimize the induction of callus from leaf explants gendarussa (*Justicia gendarussa* Burm.f.).

MATERIALS AND METHODS

The explants used are the leaves of the gendarussa (*Justicia gendarussa* Burm.f.) begins on the leaves of the 2nd to the 3rd of shoots. Explants sterilization is done by using a fungicide (ditane) 1 g per 500 mL in a beaker glass and then shake it for 8 minutes after it was washed with running water 3-5 times. Sterilization continued in the Laminar Air Flow (LAF), using a 50% solution of Clorox for 8 minutes, the last explants rinsed with sterile distilled water 3 times for 3 minutes. Gendarussa leaf is placed into a petri dish that has been lined with filter paper. Gendarussa leaf cut to a size of approximately 1 cm^2 then grown in a culture bottle on Murashige and Skoog (MS) according to treatment combined concentration of growth regulators (2,4-D, IBA, and BAP).

This study uses factorial design with two factors in combination. The first factor is the concentration of 2,4-D (D) and IBA (I), which is 0.5; 1; 1.5 mg/L combined with the second factor is the concentration of BAP (B) is 0.5; 1; 1.5; 2 mg/L. The experiment consisted of 24 treatments each treatment was repeated 3 times. Observations were made each week for 6 weeks. The cultures were incubated at 25±2 ºC by irradiating fluorescent lamp continuously.

Data were collected for callus formation time (days), the percentage of explants formed callus (%), callus fresh weight (g), callus dry weight (g) and callus morphology (changes in color and texture). Callus formation time, percentage of explants formed callus, callus morphology data were analyzed descriptively. Wet and dry weight of callus data were analyzed statistically using Two-Way ANOVA test with significance level (α) 0.05 and then tested using a Games-Howell to determine significant differences between treatment.

RESULTS AND DISCUSSION

Callus Formation Time and the Percentage of Explants formed Callus

Parameter callus formation time was intended to determine the concentration of growth regulators are faster in inducing callus and callus proliferation with the use of growth regulators (2,4-D, IBA, and BAP). The addition of plant growth regulators on tissue culture medium influences the rate of growth of explants cultured cells. Based on observations of how long it took the formation of callus from day 5 to day 7 after planting. This shows the effect of plant growth regulators (2,4-D, IBA, and BAP), but the influence is weak. The length of time the most rapid formation of callus is a combination treatment of 2,4-D and BAP than a combination of IBA and BAP, namely concentration D1,5B0,5, D1,5B1,5 and D1,5B2 on the 5th day after planting. Although there are similarities old rate of callus formation, but the treatment was also observed D1,5B2 callus mass gain relatively more than other treatments. The research result is consistent with previous studies conducted by Fadilah (2013) on a gendarussa leaf explants of callus formation indicates the length of time in the range of day 5 to day 7, the treatment of 1 mg/L NAA and 1.5 mg/L BAP a long time the fastest. According to Basri (2004) in Arianto (2013), 2,4-D is a plant growth regulator that is most often used on callus culture strong for his activities to stimulate cell de-differentiation process, pressing oragonogenesis and maintain callus growth. Activities 2,4-D show stronger when compared with other auxin. Activities 2,4-D is strong and is due to optimal carboxyl groups are separated by carbon or carbon and oxygen (Wattimena, 1988).

Callus formation is marked by the emergence of cell clumps of yellowish green or light green on the wound. Furthermore, these clots will form a mass of cells called callus. This fits opinion of George & Sherington (1984), suggests that cell division that leads to the formation of callus occurred on their response to cuts and supply endogenous or exogenous hormones into explants. Callus tissue wound closure is derived from parenchymal cells. The fastest growth of callus formation occurs in the peripheral areas of the region due to the availability of nutrients and oxygen is better.

The percentages of callus formation indicates the level of responsive explants on the use of growth regulators are tested (Rasud, 2012). Based on observations of plant growth regulator administration (2,4-D, IBA, and BAP) on gendarussa leaf explants showed that there was no effect on the percentage of explants induced callus, on the whole treated explants formed callus percentage reaches 100%. The results of this study are similar to other studies conducted by Isda & Sulianyah (2009), callus growth in all combinations of concentrations of growth regulators IBA and BAP whereas none of the explants formed callus on the media that are not added growth regulators on leaf explants of *Centella asiatica*. Research conducted by Sen et al. (2014) on leaf explants Achyranthes aspera L. by plant growth regulators 2,4-D and BAP at various concentrations successfully induce callus on all treatments. The composition of the combination of concentration of growth regulators used in this study showed a fit or able to induce callus and does not hamper growth. Based on a comparison of high and low combinations between the concentration of growth regulator auxin and cytokinin are used tend to be balanced or not too sharp difference. This is consistent with the stated Gunawan (1987) that when the ratio of auxin to cytokinin tended balanced then the cells will form a callus. Furthermore, according to Gardner et al. (1991) states that plant growth regulators require a certain amount. The concentration of plant growth regulator that is too high can not speed, but it will hamper growth. This is consistent with previous studies conducted by Rashmi & Trivedi (2014), using growth regulators 2,4-D and BAP at various concentrations in the

range of 0.5 to 10 mg / L on leaf explants *Nerium odorum.* The research results indicate the presence of callus growth at low concentrations whereas at high concentrations of 3 to 10 mg/L BAP and 2,4-D did not show any callus growth.

Wet and Dry Weight of Callus

An increase in wet weight callus due to an increased number of cells (cell division) and the increase in cell size (cell enlargement) (Gunawan, 1987). According Ruswaningsih (2007) in Indah & Ermavitalini (2013) wet weight physiologically consists of two content, namely water and carbohydrates. Wet weight of callus is due to the high water content. Wet weight produced is very dependent on the speed of these cells divide, multiply and continued with the growing callus (Andaryani, 2010).

Based on the results of statistical tests Two-Way ($\alpha = 0.05$) showed that growth regulators concentration (2,4-D, IBA, and BAP) significantly affect the weight of the wet and dry weight of callus from leaf explants of gendarussa. In general, the combination of 2,4-D and BAP have wet and dry weight of callus was higher when compared with the combination of IBA and BAP. Combination treatment the concentration of 2,4-D and BAP which has a wet weight highest in D1,5B2 treatment, which amounted to 2.247 ± 0.044 g.

The results of this study better when compared to other studies using a combination of plant growth regulator (NAA, IAA, and BAP) on leaf explants *Justicia gendarussa* Burm.f. The highest callus with a wet weight of only 1.372 g in treatment 1 mg/L NAA and 0.5 mg/L BAP. Another study conducted Palupi et al., (2004) reported a combination of optimal concentration, ie 0.1 mg/L 2,4-D and 0.5 mg/L BA induce callus from leaf Patchouli (Pogostemon cablin Benth.) With weight the highest was 2.397 g wet and dry weight of callus high of 0.167 g. The difference between the combination of optimal concentration on the study and research shows that plant species also affect the use of growth regulators such as the type, concentration and interaction between hormones.

Callus cells in optimal media (D1,5B2) is expected to be more active in cell division and enlargement, increase in osmotic pressure and increases protein synthesis when compared with other treatments. It is characterized by the growth of callus until all parts of the leaf surface at such treatment. Growth regulator auxin class of 2,4-D is a type of auxin that have a high potential to grow callus and BAP supports the role of cell division (Abidin, 1990). According Gerungan & Sumardi (1995), if the hormones impartial media or in accordance with the needs of the tissue explant meristem or parenchymal will divide continuously produce callus and the exact concentration will produce the optimal callus. In addition, according Wardani et al. (2004) differences in growth rate is affected by the network's ability to absorb nutrient substances available, it is heavily influenced by aeration and texture of the callus. The ability of water absorption in each cell varies. Cells that have wet weight contains a lot of water so that the dry weight is much smaller. In addition, according Sriyanti (2000) network capability in storing water and nutrients vary (in this case includes the ability to hold the diffusion, osmosis, cell turgor pressure settings).

Table 1. Mean of wet weight of callus on gendarussa leaf explants

Treatments	Wet Weight of Callus(g)
$D_{0,5}B_{0,5}$	0,718 ±0,111[b]
$D_{0,5}B_1$	0,263 ±0,020[a]
$D_{0,5}B_{1,5}$	1,500 ±0,444[ef]
$D_{0,5}B_2$	1,230 ±0,117[cd]
$D_1B_{0,5}$	1,373 ± 0,099[de]
D_1B_1	0,722 ±0,148[b]
$D_1B_{1,5}$	1,233±0,066[cd]
D_1B_2	1,156 ±0,067[c]
$D_{1,5}B_{0,5}$	1,669±0,115[f]
$D_{1,5}B_1$	1,489 ±0,154[ef]
$D_{1,5}B_{1,5}$	1,321 ±0,200[cde]
$D_{1,5}B_2$	2,247 ± 0,044[g]

Description: Score averages followed by the same letter show no real differences according to Duncan test (α = 0.05).

Table 2. Mean dry weight of callus on gendarussa leaf explants

Treatments	DryWeight of Callus(g)
$D_{0,5}B_{0,5}$	0,061 ±0,006[ab]
$D_{0,5}B_1$	0,040 ±0,003[a]
$D_{0,5}B_{1,5}$	0,091 ±0,005[cd]
$D_{0,5}B_2$	0,078 ±0,008[abc]
$D_1B_{0,5}$	0,078 ± 0,003[bc]
D_1B_1	0,063 ±0,011[abc]
$D_1B_{1,5}$	0,078 ±0,004[bc]
D_1B_2	0,076 ±0,008[abc]
$D_{1,5}B_{0,5}$	0,084 ±0,005[bc]
$D_{1,5}B_1$	0,083 ±0,005[bc]
$D_{1,5}B_{1,5}$	0,107 ±0,022[cd]
$D_{1,5}B_2$	0,108 ± 0,005[d]

Description: Score averages followed by the same letter show no real difference by Games-Howell test (α = 0.05).

Table 3. Mean wet weight (g) of callus from gendarussa leaf explants by administering a combination of growth regulators IBA and BAP (n=3)

Treatments	Wet Weight of Callus(g)	DryWeight of Callus(g)
$I_{0,5}B_{0,5}$	0,365±0,045[bc]	0,089±0,011[b]
$I_{0,5}B_1$	0,133±0,033[a]	0,036±0,008[a]
$I_{0,5}B_{1,5}$	0,220±0,031[ab]	0,053±0,004[a]
$I_{0,5}B_2$	0,372±0,020[c]	0,078±0,015[ab]
$I_1B_{0,5}$	0,254±0,007[ab]	0,055±0,003[a]
I_1B_1	0,163±0,039[a]	0,039±0,004[a]
$I_1B_{1,5}$	0,467±0,103[c]	0,082±0,011[b]
I_1B_2	0,224±0,013[ab]	0,056±0,003[a]
$I_{1,5}B_{0,5}$	0,216±0,060[ab]	0,055±0,012[a]
$I_{1,5}B_1$	0,367±0,006[c]	0,074±0,010[ab]
$I_{1,5}B_{1,5}$	0,440±0,035[c]	0,081±0,000[b]
$I_{1,5}B_2$	0,576±0,095[c]	0,091±0,004[b]

Description: Score averages followed by the same letter show no real difference by Games-Howell test (α = 0.05).

Callus Morphology (Color and Texture of the Callus)

Morphology of callus on a combination of concentration of growth regulators 2,4-D and BAP is different when compared to the morphology of the callus on a combination of IBA and BAP concentration. This indicates that administration of growth regulators (2,4-D, IBA, and BAP) effect on callus morphology (color and texture of the callus). Morphological observation of callus on a combination of the concentration of 2,4-D and BAP showed that in general the color change begins with a callus on the callus yellowish green to a yellowish white, then at the end of callus varied color observations become translucent white, brown, yellow-black, but there is also a white callus were maintained until the end of the observation. Texture callus on a combination of the concentration of 2,4-D and BAP showed callus textured friabel. Morphological observation of callus on a combination of IBA and BAP concentrations showed that in general the color changes that occur on the callus callus begins with light green to yellow-brown, then the callus turned brown in color or green and brown on the edges of callus contact with the media. Texture callus on a combination of IBA and BAP concentrations showed callus textured compact.

Callus color changes that occur during the 6 weeks of observation indicates a change in the growth phase cells and regeneration of cells. Yellowish green color, light green, white translucent, white, yellow, amber or green and brown shows that cells are still actively dividing (cleavage stage), while the color of brown, yellow, black or brown showing symptoms of aging cells. According Rasud (2012) describe the appearance of visual color callus callus so as to know the level of activity of a cell division. According to George & Sherrington (1984) states that the callus color change was caused by the synthesis of phenolic substances on cells (callus). Phenol compounds appear to be toxic to cells when in excessive concentrations, which will inhibit the growth (Hayati et al., 2010). The statement was reinforced by Widayanto (2004) that changes colors on the callus from yellowish white to brown indicates a decrease in the growth of the cells of the callus. Such cells have very low cleavage activity so that the power of regeneration has been reduced.

Based on observations during the six-week, the combination of 2,4-D and BAP on D1,5B1,5 treatment and callus D1,5B2 show color changes more slowly when compared to other treatments and colors translucent white callus was maintained until the end of the observation, while in a combination of IBA and BAP on I1,5B1,5 treatment and callus I1,5B2 show color changes more slowly when compared to other treatments and colors of green callus, although at the edge callus brown contact with the media is retained until the end of the observation. The results of this study is better than other studies using leaf explants *Justicia gendarussa* Burm.f. by administering growth regulator (NAA, IAA, and BAP), callus formed tends to undergo browning (browning) and compact textured on all treatments (Fadilah, 2013). According Manuhara (2014) suggested that the callus is white or transparent in general is composed of callus tissue meristematis, while the green callus generally indicate a network which has undergone differentiation of embryonic tissue to form.

Texture callus is a marker used to determine the quality of callus produced by explant (Rasud, 2012). Callus growing callus friabel is separated into small portions, easy off, and contain a lot of water (Sitorus et al., 2011). Instead callus-type compact has a texture that is subtle and looks solid (Widayanto, 2004). Related to the quality of callus good texture, depending on its purpose. According Turham (2004) good callus has crumb texture because it is easily split off into single cells. According Pierik (1987) states texture on the callus can vary from compact to crumble, depending on the type of plants used, the composition of the nutrient media, growth regulators and environmental conditions culture.

In general, callus with friabel texture is more than the embryonic callus on solid textured (Manuhara, 2014).

Based on observations of overall callus induction from leaf explants with giving substance gendarussa growing influence of 2,4-D, IBA and BAP largely parameter analysis shows that optimal treatment is D1,5B2. The success depends on the use of callus culture media base, a combination of plant growth regulators and environmental factors appropriate (George & Sherington, 1984). In addition, according to Evans & Sharp (1986) in Ajijah et al. (2010) the ability of each plant and plant tissue to form callus is not the same. Use of Murashige and Skoog (MS) can induce proliferation of callus (Soh & Bhojwani, 1999). The factors that most affect plant growth in vitro is the interaction and balance between the supply of plant growth regulators endogenously and exogenously by cells cultured (George & Sherington, 1984). Furthermore, according to Nickell (1982) plant growth regulators including the type, concentration and the combination was instrumental in influencing the physiology, growth and development of plants (explants). Plant growth regulators are widely used for callus induction is the combination of auxin and cytokinin (Zulkarnain, 2009). The findings are consistent with studies conducted by Gao et al. (2011) showed that the results of callus induction by the use of growth regulators between auxin and cytokinin in combination is more effective than either alone. Akusin growth regulator substances stimulate the growth of callus, while the cytokines involved in the regulation of cell division (Gunawan, 1988).

CONCLUSION

According to the result and discussion we conclude that various concentration of plant growth regulators (2,4-D, IBA and BAP) effected on callus induction from leaf explants of gendarussa. The most optimal treatment combination of concentration of plant growth regulators in inducing callus from leaf explants of gendarussa is D 1,5 B 2 (1.5 mg/L 2,4-D and 2 mg/L BAP) with a relatively long period of callus formation at the earliest, i.e. on day 5, 2,247 g wet and dry weight of 0.108 g, white callus translucent and textured friabel.

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DILEMMAS AND SOLUTION OF BEEF CATTLE FARMING ON GLOBAL WARMING IMPACTS

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ABSTRACT
The objective of the research to observe the effects of diets on the dry matter intake and digestibility, fecal yield, estimation of methane produce and proportion of methane gas produce to dry matter intake by Rambon cattle. Twenty one heifer of Rambon beef cattle cows were used in the research, three variation of diets which were included P0 containing grass only as the control, P1 containing grass and formulated concentrate with containing corn oil, P2 containing grass combine with formulated concentrate with containing corn oil, and urea fibrolite molasses lick. The experimental animal divided into three groups, so each group consisted seven animals as replications. The research was designing into Complete Randomized Design (3 x 7 replications), and it was run about two months. Results of the experiment showed there are no significant ($p > 0.05$) different of dry matter intake, it range about 26.76 to 27.87 kg/h/d. Dry matter digestibility was higher ($p< 0.05$) in P2, it about 78.5 %. Again, animals in group P2 which were received some grasses and combination with formulated concentrate and urea fibrolite molasses lick produce fecal yield was higher ($p< 0.05$) at about 6.88 kg/h/d. By using equation to predict enteric methane gas produce every day were not significant differences among treatment group, its range about 476.75 to 483.72 l/h/d, with the proportion of methane to dry matter intake range about 6.5 to 7 %. It was concluded that fecal produce by beef cattle can be converted to methane energy resource of biofuel and organic fertilizer.

Keyword: beef cattle, corn oil, formulated concentrate, methane, UFML.

INTRODUCTION
The current issue of One Health System focus on protective animal and human health, also wellbeing. Beef cattle provide some food protein like a meat for human consumption to meet healthy condition and intellectuality development. Zoonotic disease, pollutant comes from the farm may influence the human and animal welfare, therefore by proper beef cattle farming management it can be prefer healthy livestock for safer food and green environment. Breeding program for heifer and beef cattle cow is the way to make sustainable beef cattle farming with a high productivity, however, some dilemmas in the farm that ruminant animals during their live produce some waste product such as feces, urine which are containing carbon dioxide, nitrous oxide and methane gas like greenhouse gas (GHG). By increasing number of beef cattle, the amount of feces and GHG also increase. It means number of pollutant also increase, because during metabolic process, beef cattle produce some enteric methane gas and it be comes out by eructation and together with feces and urine which can impacts on global warming and climate change.

METHOD
Totally 21 female beef cattle belong to Rambon breed of Indonesian native beef cattle were used as the experimental animal, there were heifer and or cow animals. In the initial research the average of body weigh range about 331 to 358 kg and the average of age about two to three years of age. The experimental animals were divided into three groups (P0, P1 and

P2), so each group consisted seven Rambon beef cattle. Three variation of diets, that includes: P0 is diet consisted grass only, P1 is diet consisted grass plus 1 kg formulated concentrate, and P2 is diet consisted grass combined with 1 kg formulated concentrate plus 100 g urea fibrolite molasses lick (UFML). Each group of the experimental animals received diet according to the type of diet, such as group P0 received grass only, group P1 received grass plus 1 kg of formulated concentrate, and group P2 received grass combined with 1 kg formulated concentrate plus 100 g urea fibrolite molasses lick (UFML). Therefore, the research was designed into Complete Randomized Design (3 x 7 replications). The research was run about two months with one week adaptation period of the treatment diets. The parameters were measure include: dry matter intake per head per day, fecal excrete per head per day, percentage of digestibility of dry matter, estimation of methane gas produced by Rambon beef cattle by using equation by Shibata et al (2013): CH_4 (l/d)= 17.766 + 42.793 X – 0.849 X^2. Whereas X is dry matter intake (kg/head/d).

The data collected were analyze by using Analysis of Varian and Duncan's Multiple range test method based on Complete Randomize pattern and it used SPSS version 13.00 Software.

RESULTS AND DISCUSSION

Table 1 showed the dry matter intake (DMI), dry matter digestibility (DMD) and total feces by Rambon Cattle based on the treatment group. Total dry matter intake were not significant different ($p > 0/05$) among treatments group, it were range about 26.76 to 27.87 kg/h/d. However, the dry matter digestibility (DMD) were significant difference ($p < 0.05$) among treatments group. The DMD of group P2 was highest ($p < 0.05$) compare to DMD in group P0 as control group, whereas DMD in group P1 in between P0 and P2. The DMD percentage of P0, P1 and P2 were 74.85 %, 77.80 %, and 78.50 %, respectively (Figure 1).

Table 1. Mean of Dry Matter Intake (Kg/head/day), Dry Matter Digestibility (%), and Total Feces (kg/head/day) of Rambon Cattle Based on Treatment Group

Parameter	P0	P1	P2
DMI, kg/head/day	26.76	27.47	27.87
DMD, %	74.85^{b}	77.80^{ab}	78.50^{a}
Total Feces, kg/head/day	5.46^{b}	6.12^{ab}	6.88^{a}

[a and b] Superscript at the same row were significantly difference ($p < 0.05$).

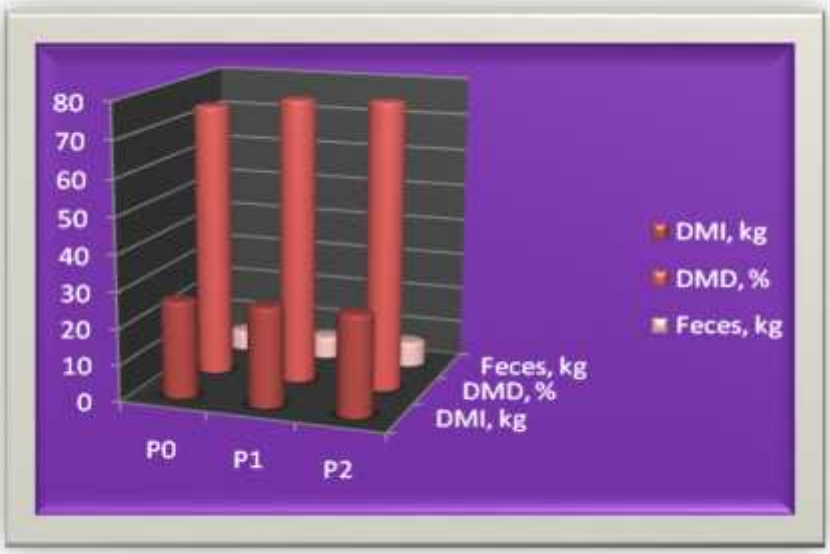

Figure 1. Showed The Level of Dry Matter Intake (DMI), Dry Matter Digestibility (DMD) and Total Feces by Rambon Cattle Based On Treatment Group.

Even the Rambon cattle in group P0 did not received formulated concentrate and or urea fibrolite molasses lick as a feed supplement, the dry matter intake were not significant ($p > 0.05$) different with group P1 and P2. The reason is the quantity of dry matter of grass consumption were not significant ($p > 0.05$) difference too among these three groups, and be supported by high quality of the grass (10.9 %). Because the farmers harvest the grass from the area padi land with good maintained with fertilizing these soil. Formulated concentrate containing corn oil have a high protein content (17.1 %), while urea fibrolite molasses lick containing Excelzyme-2 which have fibro lytic enzyme, the UFML containing 10.3 % of protein content. Rambon cattle in group P1 and P2 have a high ($p < 0.05$) dry matter digestibility (DMD) compared to control group (P0), because of the effects of supplementation using formulated concentrate containing corn oil and or UFML. By increasing level of protein intake by the animal, it affect on increasing dry matter digestibility, because it more efficient for the utilization of nutrient by animals. The indigestible feed was excrete as a feces, and the ruminant animal fecal containing some gas like carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (NO_2) as well as Green House Gasses (GHG) emission which impact on climate change and global warming. It is known that ruminant animal has multiple stomach and can converted the fiber matter to volatile fatty acid (VFA) by *an aerobe* microorganism in the rumen. During the metabolic process, some GHG emission was produced and eliminate by eructation and excreted by fecal.

Mean of Estimated Methane gas produced by Rambon cattle, and the ratio of Methane produce to dry matter intake (CH_4/DMI) were shown in Table 2. Results of the research showed that no significant ($p > 0.05$) differences among treatment group for producing methane gas. The estimation of methane gas produced by Rambon cattle range about 476.75 to 483.71 l/head/day. Its mean the supplementation of formulated concentrate with or without UFML bring the same level to produce methane gas with the control group or animal received grass only in the diet (Figure 2). Also, the ratio between estimated methane gas produced by cattle to dry matter intake showed no significant ($p > 0.05$) different too (Table 2 and Figure 3). In the research, there are no difference on methane gas emission produced by Rambon cattle among these three groups, because the quantity of formulated concentrate supplemented to the group P1 and P2 only 1 kg/head/day, it is not too much, and the formulated concentrate

containing corn oil and or combine with UFML supplemented may increase of feed and nutrient efficiency.

Table 2. Mean of Estimation Methane Gas Produced and Ratio Methane Gas Produced To Dry Matter Intake

Parameter	P0	P1	P2
Estimation of Methane gas produced by Rambon cattle, l/head/day	476.75	479.98	483.71
Ratio CH_4/DMI,%	6.5	6.5	7.0

Ratio of estimated methane gas produce by Rambon cattle range about 5.5 to 7 %, it is normally range methane produce by beef cattle according to dry matter intake. There are some factor which influence the methane produce by the ruminant animal, such as: feed quality and quantity, physiologist condition: digestion, metabolism, stage of growth, reproduction status, diseases (Broucek, 2014).

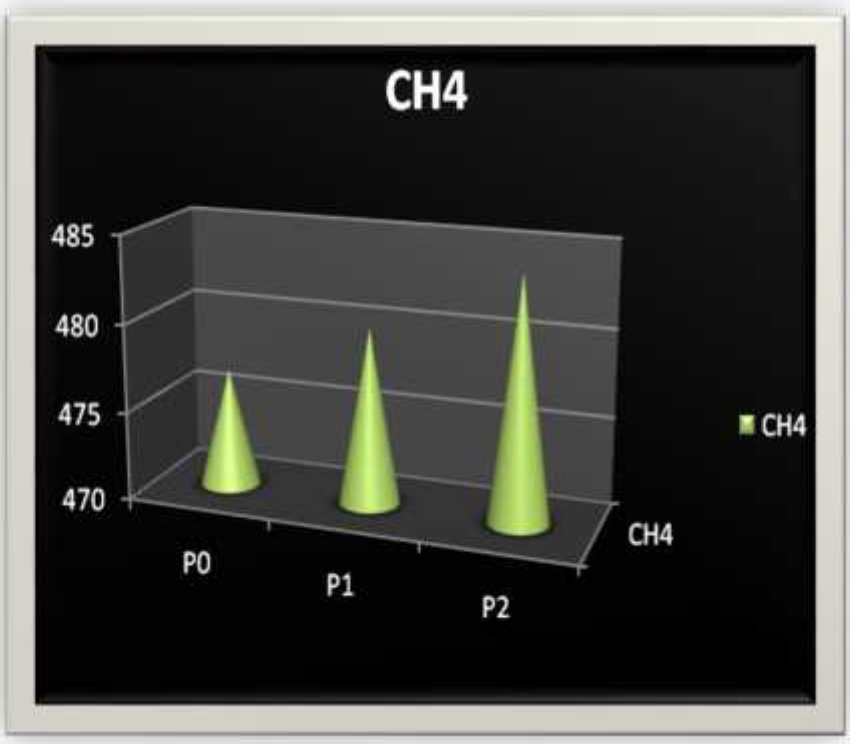

Figure 2. Mean of Estimated Methane Gas Produced by Rambon Cattle Based on The Treatment Group.

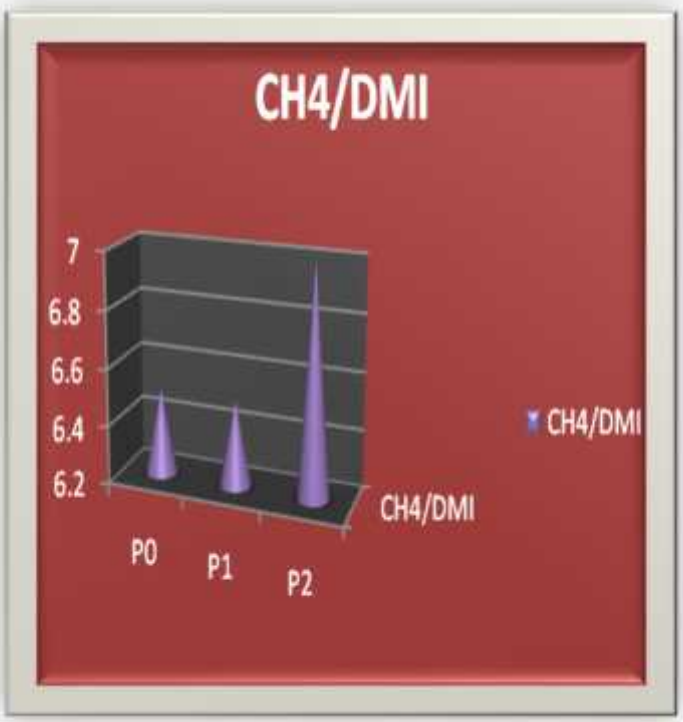

Figure 3. Ratio Estimated Methane Gas Produced by Rambon Cattle
To Dry Matter Intake (%)

CONCLUSION

Formulated concentrate containing corn oil and Urea Fibrolite Molasses Lick as feed supplement for beef cattle could increase the dry matter digestibility and it may produce methane gas in normal range to dry matter intake, it was range about 6.5 to 7 %.

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ENVIRONMENTAL SANITATION OF SURABAYA ZOO

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ABSTRACT
Surabaya Zoo is not only as a private collection of exotic animal shelters, but also becomes center for protection and conservation, education, research, and recreation. Therefore, Surabaya Zoo is an importance place for public, so it is necessary to assess its environmental sanitation. The aim of this research is to determine the environmental sanitation of Surabaya Zoo. The research method was obtain primary and secondary data through interviews and observations. The results shown that the sanitation of buildings categorized as excellent, but there were some broken air conditioners in the aquarium building. The sanitation of animal cage was categorized as poor, and the sanitation of other facilities were categorized as adequate. Hence, the average categorize above all parts of environmental sanitation of Surabaya Zoo is adequate standard. It is advised to improve environmental sanitation in the animal cages, repair the air conditioners in the aquarium building and maintenance them regularly, as well as repair the incinerator chimney.

Keywords: Environmental Sanitation, Surabaya, Zoo

INTRODUCTION

Zoo is a wildlife preservation for three (3) classes of taxa in areas at the least 15 (fifteen) hectares with visitors who do not ride motor vehicles (Minister of Forestry of Indonesia, No.P.31, 2012). The animals that live there, are all the three types of animal from natural resources, which are animal that live in the land, water, and air (Regulation of Indonesia no. 5, 1990). The Functions of Zoo are (a). As a center for the familiarization of wildlife varieties for the society, especially the younger generation (b). As a place of research of characters and behavior of wildlife diversity and the sustainable use (c). As a recreational facility for people to enjoy the natural beauty, especially and the diversity of wildlife (d).The human efforts to protect and breed endangered species from extinction (PKBSI, 2011). Zoo has a great tourism potential to be developed into a tourist destination especially educational tours (Sukawi, 2009). Likewise, the Surabaya Zoo, not only as a private collection of exotic animal shelters, but also protection and conservation function, education, research, and recreation. The good image of Surabaya Zoo can be as Surabaya's unique icons (Herdanto, 2012). Because Surabaya Zoo is an important place for public, so it is beneficial to assess the environmental sanitation of Surabaya Zoo. The purpose of this research was to assess environmental quality of Surabaya Zoo.

METHODS

This research was conducted by collecting primary and secondary data. The primary data obtained through observation and assessment of environmental sanitation. The secondary data obtained from Surabaya Zoo management. Primary and secondary data were analyzed descriptively and presented in a narrative. The observation of environmental sanitation is divided into three sections, building construction, animal shelters and other facilities. The building construction is a construction that is in the Surabaya Zoo, namely: the secretariat office, mosque, toilets, aquarium, dioramas, Nocturama, souvenir shops, canteens, offices nutrition, office collection, office of public works, toilets, security post,

the information space, ticketing (counter), library, quarantine, animal nursery, water attractions, and performing animals. The cage observed were all the cages in Surabaya Zoo. Other facilities were Islamic Prayer Room, animal hospital, animal quarantine, children's playground, incinerators, and cafeteria. The categorization used is divided into 3 (three) kinds: excellent (if the assessment result >80% from maximum score), adequate (if the results of the assessment reaches 60% -80%), and poor (if the assessment result <60%).

RESULTS AND DISCUSSION

Surabaya Zoo located in Setail Street no.1, in the corner of Wonokromo Street and Diponergoro Street. Surabaya Zoo actually excluded in disaster-prone area, around 200 meters from Joyoboyo Bus Station. As one of the green open space in Surabaya, Surabaya Zoo also becomes ex-situ conservation (out of the origin), which include endangered and protected species which come from Indonesia as well as other countries. Some sources of water in Surabaya Zoo is: the river water, wells, taps, and the seawater used for sea water fish aquarium. Surabaya Zoo is equipped with sewer water, which flowed into the river. This sewerage is also function as channels for rainwater. Surabaya Zoo waste cleanup is done every day from 07:00 until 16:00. Cleaning animal droppings in the cage area carried out by the keeper of each cage which then placed in front of the cage. Garbage on the street which sometimes get into the sewer, was cleaned by workers and placed on a side street. Then, this garbage was taken to the polling station with the waste that come from inside the cages. This polling station is near the car park.
The results of observation from three sections shows the value as in Table 1.

Table 1. Environmental Sanitation Assessment of Surabaya Zoo

Sections	Score of the section	Maximum Score	%	Note
Building Construction	5540	6300	87,94	excellent
Animal’s Cages	982	2280	43,07	poor
Other Facilities	633	819	77,29	adequate
Total	7155	9399	76,13	adequate

In the construction of the buildings, the total score which obtained was 5540 from a maximum score of 6300 or equal to 87.94%, it means that the environmental sanitation in the construction of buildings included in excellent category. However there were some broken air conditioners, especially in the aquarium building is rather covered or has minimum air circulation.

In the animal’s cages, the total score which obtained was 982 from a maximum score of 2280, it is equal with 43.07%. Which means that the environmental sanitation in the cages section categorized as poor. In fact, the sewerage of animal enclosure is not functioning properly and the animal feces was not immediately cleaned, the waste water flow from the cages tend to be unmanageable. This condition cause an unpleasant smell and can disrupt the aesthetic comfort of the visitors in Surabaya Zoo.

On the other facilities section, the observation shows that the total score which was obtained is 633 of 819 maximum score, in other words it is about 77.29%, which means the environmental sanitation conditions in the other facilities section categorized as adequate. Here the researcher found that the incinerator chimney in the zoo is already broken. But it's still an active incinerator that used to burn the animal carcasses. Thus, the overall score of the whole assessment in Surabaya Zoo environmental sanitation obtained

of 7155 from the total maximum score 9399 (76.13%), which means the average result of all sections categorized as adequate..

CONCLUSIONS AND RECOMMENDATIONS

From the assessment and observation that has been done, it can be concluded that the condition of environmental sanitation of Surabaya Zoo was categorized as adequate. Some suggestions that can be solution in the future are: (1) it is necessary of improvement in environmental sanitation in the animal cages, (2) immediate repair the air conditioners as well as aquarium maintenance on a regular basis, (3) the necessity for improvements at the main incinerator chimney.

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ETAWA AND ENVIRONMENT RELATED TO MALARIA VECTOR DENSITY AND MALARIA INCIDENCE IN SOMONGARI VILLAGE, KALIGESING DISTRICT, PURWOREJO, CENTRAL JAVA IN 2015

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ABSTRACT
Purworejo Regency is one of the malaria endemic areas in Central Java. Based on the Central Bureau of Statistics (2014) reports in 2011, malaria cases in Purworejo was 1001 cases, in 2013 dropped into 527 cases but rose again in 2013 into 704 cases. Thus, malaria remains a serious problem in Purworejo. The existence of livestock associated with the incidence of malaria (Multobo, 2013). The existence of Etawa goat and the environment related to malaria vector density and the incidence of malaria. The Somongari Village, Kaligesing District is a village with a high incidence of malaria. The study is aim to know about the relation of Etawa existence and environment factors with malaria vector density and the incidence of malaria in the Somongari village, Kaligesing District, Purworejo, Central Java in 2015. This study was a cross sectional study with population of all houses in the Somongari village which has a livestock of Etawa. Sampling was done by using purposive sampling of 3 houses are less than 10 meters from the cage of Etawa, 3 houses within 10-20 meters and 3 houses are more than 50 meters away from the cage of Etawa. Environmental data is taken from the air temperature, humidity, pH water, the vegetation, the presence of Etawa, where gauze on home ventilation, wall types, malaria vector densities, which is obtained by calculating the density hour man (MHD) and the man biting rate (MBR). Relationships of Etawa and environment factors with malaria vector densities were analyzed by Mann-Whitney and Kruskal Wallis test. While malaria vector densities relationship with malaria incidence was analyzed by Pearson correlation test. The results showed that the malaria vector densities in the house is 0.17 / person / hour, outside the home is 0.42 / person / hour and at home is 1.78 / person / hour. The existence of Etawa was not related to malaria vector densities both in the home ($p = 0.1$), outdoors ($p = 0.5$) and in a cage ($p = 0.9$). Etawa pungent odor is repellent function and not as atractant. However, the physical state of the house serves as a port of entry is more mainstream. The house is made of wood / boards will be more at risk as malaria vectors port of entry into the house so that the resulting density of mosquitoes in the house is higher than outside. Therefore, the application of Etawa as malaria vectors repellent should also be supported by the environmental sanitation and good physical condition. Other findings showed that the malaria vector densities in the home ($p = 0.57$), outdoors ($p = 0.41$) and at home ($p = 0.31$) was not associated with the incidence of malaria. However, the density of Anopheles larvae based on suvei conducted in this study is high (1.71 larvae per detention). In future studies, the mosquito density measurements should be adjusted to the life cycle of the Anopheles mosquito. The density of mosquitoes were found relatively low. High rates of malaria are not comparable with the number density of mosquitoes. Handling the incidence of malaria has to be done so that people with malaria receive protection through the treatment, prevention, and control of public health center personnel.

Keywords : Anopheles, MHD, Etawa, environment, malaria

INTRODUCTION

Malaria is an infectious disease caused by *Plasmodium* and can affect all people in all age groups. Based on *The World Malaria Report* (2011), in 2010 aprroximately 655,000 people death from Malaria. About 91% of deaths was in Africa, 6% in South East Asia and 3% in east Mediterania. Over all approximately 3,3 billion the world's population live in areas at risk or endemic malaria.

Indonesia is one country that is still has risk in malaria transmission. The data from Indonesia Ministry of Health (2014) shows that Annual Paracite Incidence (API) in 2005–2013, tend to be decline from 4,1 per 1.000 population at risk in 2005 to 1,38 per 1.000 population at risk in 2013. However, the scope of API in 2013 is still not achieve the target of the Strategic Plan in 2013 that is < 1.25 per 1,000 population at risk. Until 2013 all provinces in Indonesia except Jakarta are still a malaria endemic area. In Java, malaria endemicity found in three provinces, namely Central Java, D.I. Yogyakarta and Banten with the highest API in Central Java, which is 0.04 per 1000 population at risk.

API malaria each year in Central Java is still fluctuative. Based on the report Ministry of Health, API consecutive period 2005-2013 in Central Java was 0.06; 0.13; 0.12; 0.07; 0.08; 0.10; 0.01; 0.03 and 0.04 per 1,000 population at risk. Purworejo Regency is one of the malaria endemic areas in Central Java. Based on the Purworejo Central Bureau of Statistics reports (2014), cases of malaria in Purworejo in 2011 is 1001 cases, in 2013 dropped to 527 cases but rose again in 2013 to 704 cases. So that malaria remains a serious enough problem in Purworejo.

Many factors affect the incidence of malaria. According Wibowo (2014) malaria is transmitted by mosquitoes, but as ecology disease is strongly influenced by environmental conditions. Environmental conditions affecting the malaria vector densities in an area that eventually contributing to the high incidence of malaria. The conditions are air temperature, water pH and the presence of vegetation (Anies, 2006), the humidity (Datau, 2000) and the existence of livestock such as goats malaria (Mulyono, 2013).

Erdinal et al (2006) showed that the placement of livestock far from house is needed to make mosquitoes bite goat first before humans. According to the Ministry of Agriculture, placements of cattle remain to be separate from the house within a minimum of 10 m to prevent homeowners from being exposed to the disease. According to Ramadhani (2004), those who have cattle placed in the home or less than 10 meters at risk of malaria 5.49 times greater than that put livestock separately.

By Babba (2007) they who house walls made of wood / boards are 3.14 times has risk of contracting malaria than those who had a wall made of a cement. This can be caused because most of the houses with wooden walls / boards has space that making it easier for mosquitoes to enter.

The existence of the ceiling (flafon) can also affect the malaria vector densities. According Dance et al (2013) those whose homes do not have a ceiling (flafon) house has 5 times higher risk of contracting malaria than those who had a ceiling (flafon) home. This can be due to homes that do not have flafon will facilitate the entry of mosquitoes into the house. Therefore, according to Ram et al (2014) required the installation of the ceiling to reduce the incidence of malaria.

Installation of gauze on home ventilation can also affect the malaria vector densities. According Natadisastra (2009) installation of gauze on ventilation can reduce mosquito bites so that it can cut transmission of malaria in humans. Based on several studies it can be concluded that the presence of livestock in the form of Etawa and environmental conditions such as air temperature, humidity, pH water, the vegetation, the

type of walls of the house, where the ceiling and installation of netting on home ventilation can affect the density of vector malaria eventually also affect the incidence of malaria.

According to data from the Central Bureau of Statistics (2014), of malaria cases in the District Kaligesing in 2013 reached 265 cases. While in 2014 based on reports from public health centre of Kaligesing, malaria cases in the village of Somongari reached 179 cases, positive plasmodium were 6 cases. In January to October 2015 in public health centre in village, malaria cases have increased to 357 cases and were found, positive for plasmodium also increased to 90 cases.

Based on the researches and the data above, the authors wanted to know the relation Etawa and environment with malaria vector density and the incidence of malaria in the village Somongari, District Kaligesing, Purworejo, Central Java in 2015.

MATERIAL AND METHOD

This research was a cross sectional study conducted on June to November 2015. The study population was the whole house in the village which has a livestock of Etawa. Sampling was done by using purposive sampling, 3 houses were less than 10 meters from the cage of Etawa, 3 houses were within 10-20 meters, 3 homes were more than 50 meters away from the cage of Etawa. So that the overall sample size is 9 homes with a degree of confidence of 95% and 80% strength test.

Physical environment. Temperature and humidity were measured using Temperature and Humidity Meter (HTC-2), while pH of water was obtained by measuring the waters within ≤ 3 km from home. Home condition such as ventillation, wall, and flafon was found by observation.

Biology Environment. The kind of vegetation was obtained through observation in the area.

Malaria vector. Catching mosquitoes was conducted from 18.00 until 24.00.

The catching were carried out as follows:

(1) Catching mosquitoes feed people in the house every hour for 40 minutes
(2) Catching mosquito landed on the wall in the house every hour for 10 minutes.
(3) Catching mosquito landed on people hand outside the house every hour for 40 minutes.
(4) Catching mosquito landed in the cage every hour for 10 minutes.

In order for the exact time of catching used a stopwatch. The catcher seating inside and outside the house with his pants rolled up to his knees and mosquitoes immediately captured with aspirator then inserted in a paper cup, differentiated according to time and location of catching. After 40 minutes lasted catcher then make catching on the walls inside the house and in the cage for 10 minutes. The paper cups labeled and submitted to the coordinator to be checked.

Malaria vector identification. Identification of malaria vectors carried out by experts from the Institute Research of Disease Control Animal Sourced (Pengendalian Penyakit Berbasis Binatang) Banjarnegara directly in the field to get the genus and mosquito species. This identification is done using a stereo microscope. Malaria vector density measurements performed using per Man Hour Density formula :

No. of mosquitoes collected / No. of man hours spent in search

Malaria Incidence. The number of family members in the home who had been diagnosed with malaria in the past year obtained through interviews with homeowners. The results of the interview then recorded in a questionnaire that has been provided. Malaria vector larvae habitat surveys carried out in the morning by using detention, small bottles, 70% alcohol, refractometer, glass objects and the lid, label paper and compound microscopes. The survey results then recorded into larva survey form.

RESULTS

Based on catches that have been done at 18.00-24.00m malaria vector obtained as follows.

Table 1. Malaria Vector Species in Somongari Village

Malaria Vector	Numbers
Anopheles balabacensis	2
Armigeres sp	15
Culex sp	20

Based on the survey results that has been done in Batang Kalen river gained as much as 19 larvae of malaria vector mosquito larvae with a density of 1.71 larvae per detention. This larva was found in five points or puddles river. The average of air temperature in the Somongari village was 23,67◦C with the lowest temperature and the highest were 23,54◦C and 23,77◦C. Average air humidity in the village Somongari was 72.44% with the lowest humidity was 72% and the highest was 73%. The pH of water were away from normal, namely 6.

Somongari village is surrounded by a variety of vegetation that can serve as a resting place malaria vectors. Vegetation found in the form of plantations and fields. Plantation consists of a tree mangosteen, durian and melinjo while farm produce buffoonery and cubeb. Of homes studied in the village, 66.7% walls made of wood / board, no ventilation, 88.9 % has no flafon.

Based on catches of mosquitoes that have been conducted in the village of Somongari, obtained an average density of malaria vectors in the home is 0.17 / person / hour, outside the home 0.42/ person / hour and at home 1.78/ person / hour. Survey results obtained 6 people who have had malaria in the past 1 year. The following are the results of statistical relationship between two variables.

Table 2. Vector densities relationship with social culture, malaria incidence, and cage of etawa existence

Variables	Results		
	Malaria vector densities inside house	Malaria vector densities outside house	Malaria vector densities in the cage of Etawa
Walls from wood/board	p = 0,29	p = 0,57	p = 0,76
Walls from cement			
Flafon	p = 0,59	p = 0,40	p = 0,49
No flafon			
Malaria incidence	p = 0,57	p = 0,41	p = 0,31
Etawa cage < 10 m from house	p = 0.1	p = 0.5	p = 0.9
Etawa cage 10 - 20 m from house			
p>50 m from house			

The table shows that there is no relationship between these variables with malaria vector densities.

DISCUSSION

The most dominant mosquito species in number is the type of Culex sp, which spawn in the roots of grass plants water, swamps, puddles or ditches. In addition Culex sp can live well in domestic wastewater containing oil, soap and detergent (Novianto, 2007). Culex sp active period is at 7 p.m. to 6:00 pm. The highlight of this vector active in the house is at 19:00 to 20:00 pm and at 5:00 to 6:00 pm, while outside the home at 23:00 to 02:00 am. Culex sp is like a resting place that is dark (low light), clothes hanging, ceiling and furniture (Astuti et al, 2010). It shows that Culex sp has high frequency to contact to human.

The layout of the Batang Kalen river is along Sumongari village used as a source of water for the needs of local communities. At the time of mosquito larvae surveys conducted in the village during the dry season, so there are a lot of stagnant water which is potential as breeding mosquito vectors. The survey results obtained mosquito larvae primary vector of malaria incidence is *Anopheles sp*, amounted to 19 larvaes with a density of 1.71 larvae per detention. Flick was found in five points puddle river.

Physical and chemical environment condition in the Somongari village support for the growth of malaria vector. Moreover vegetation conditions in the village are filled with trees and shrubs that serve as mosquito resting place.

The finding of no relationship between the type of house walls, gauge in ventilation, the existence of flafon with malaria vector densities because was home condition almost entirely the same which is made of wood / board, no gauge in ventilation and no flafon. Coverage area of research that is too narrow, therefore can not generalize an entire region.

In this study Etawa who have thick fur serves as a repellent (unwelcome odors) by the mosquito vector and not as an attractant. This is because the smell of Etawa is more stinging compared to other species, so that mosquitoes prefer to be in the cage area of Etawa than being at home that did not have goats. Home physical potential role as a port of entry that thwart Etawa role as a repellent. The house is made of wood / boards will be more at risk as malaria vectors port of entry into the house so that the resulting density of mosquitoes in the house higher than outside than inside house.

CONCLUSION

Although the density of Anopheles mosquitoes as the primary vector is relatively low, but the density of Anopheles mosquito larvae base on suvei conducted, the number of larvae is high at 1.71 larvae per detention. The absence of a relationship between the incidence of malaria in the Somongari village with a density of Anopheles sp, not because of the low density of mosquitoes, nut only the time used in this study are less precise so that the density of mosquitoes were found relatively low. In future studies, the mosquito density measurements should be adjusted to the life cycle of the Anopheles mosquito. Handling the incidence of malaria has to be done so that people with malaria receive protection through the treatment, prevention, and control of public health center personnel

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ENVIRONMENTAL HEALTH FACTOR RELATED WITH ACUTE RESPIRATORY INFECTIONS UNDER-FIVE CHILDREN IN LIKUPANG PUBLIC HEALTH CENTRE WORKING AREA OF EASTERN LIKUPANG SUB-DISTRICT, NORTH MINAHASA DISTRICT

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ABSTRACT
Acute Respiratory Infections (ARI) is disease that often occurs in under-five children. This resulted death and disability such as akuta otitis media (AOM) and mastoiditis. According to report data of morbidity in Likupang Public Health Centre in 2015, Eastern Likupang Sub-District is giving contribute on inreasing the incidence of ARI of 10 major diseases on Likupang Public Health Centre, which is 925 cases. The study is aimed to know about the relation of environmental health factors with Acute Respiratory Infections (ARI) in under-five children living in Eastern Likupang Sub-District. Type of study is a cross sectional study covering 35 under-five children living in Eastern Likupang Sub District from Agustus – September 2016. Data were analyzed using descriptive statistics and chi-square test. The results showed that there is no relation between house ventilation (p=0,782), residential density (p=0,139), lighting (p=0,673), temperature (p=0,568) and humidity (p=0,268) with the cases of Acute Respiratory Infections in under-five childrens in Eastern Likupang sub-district because of the value of $p \geq 0.05$. Likupang Public Health Centre needs to improve the provision of information to public about environmental health factors that trigger the disease of Acute Respiratory Infections in under-five children.

Keywords: Environmental Health, Acute Respiratory Infections, Under-five Children

INTRODUCTION

Environmental health focuses on the planning, organizing, directing, controlling, organizing an assessment of all the factors that exist in the human physical environment. Environmental sanitation is the health status of an environment that includes housing. The sanitary facilities include ventilation, temperature, humidity, residential density, natural lighting, construction, garbage disposal facilities, human waste disposal facilities and the provision of clean water. House sanitation is closely associated with morbidity rates, especially infectious diseases Acute Respiratory Infections (ARI).

ARI often occurs in infants. According to experts, the child's immune system is very different from adults because the body's defense system is not yet strong. If in a family member's home colds, under-five childrens will more easily infected. With the condition of children who are weak, the spread of disease more effectively. ARI risk of death in children in small amounts, but the cause of disability as Akuta Otitis Media (AOM) and mastoiditis. ARI in infants is generally a first as well as the incidence of infection has not been established optimal natural immune processes. In adults it has been a lot happening more optimal natural immunity due to previous infection experience. Based on data from Indonesia Health Profile 2010, ARI is one of the 10 most prevalent diseases in outpatients at the hospital. ARI period prevalence (13.3%) the lowest prevalence was found in the town of Tomohon Bitung and respectively 0.5% and the highest obtained at the District Talaud (2.7%). Highest prevalence of ARI in infants (> 35%), while the lowest in the age group of 15-24 years. The prevalence is likely to increase again in accordance with increasing age. The prevalence between men and

women -Eighteen relatively similar, and slightly higher in rural areas. Prevalence based on data from the Health Department Manado 10 diseases in outpatients in health centers Manado city, respiratory disease is one disease first order as many as 46 077 cases (0.11%) (Profile Manado City Health Office, 2015).

Based on data from ARI Disease Control Program that acute respiratory infections (ARI) received the first order of 10 prominent disease. According to data reported cases of illness PHC Likupang In 2015, one of the districts in North Minahasa Regency that has the incidence of ARI of 10 major disease that most often affects people is the District Likupang East, which is the working area of Puskesmas Likupang in 2014, at the health center Likupang ARI incidence rate of the first rank is 925 cases.

METHODS

This research is a descriptive study with a design Cut latitude (cross-sectional) using observational approach. The variables of this research consisted of two variables: environmental factors and ARI in infants. Data of this study was a questionnaire, observation, and interviews. This study was analyzed using descriptive statistics and Chi Square test. This research was conducted at the health center in particular Eastern Likupang Sub-District, North Minahasa District 2015.

The study population is under-five children who resides in Puskesmas Likupang Likupang District of East, amount of 35 children. Sampling was done by using total sampling technique.

RESULTS

Univariate Analysis Results

Univariate analysis performed to determine the frequency of an overview of each independent variable and the dependent of a under-five children who totaled 35 people who came from statistical test results of primary data.

Table 1. Distribution of Respondents by Age Group

Age Group (Month)	Frequencies	%
12 – 23	8	22,8
24 – 35	19	54,4
36 – 49	8	22,8
Total	35	100

Table 2. Distribution of The Incidence of Acute Respiratory Infections (ARI)

The Incidence of ARI	Frequencies	%
ARI	21	60
Non-ARI	14	40
Total	35	100

Table 3. Distribution of Environmental Health

Environmental Health	Adequate	%	Inadequate	%
Ventilation	19	54,3	16	45,7
Residential Density	32	91,4	3	8,6
Lighting	21	60	14	40
Temperature	22	62,9	13	37,1
Humidity	16	45,7	19	54,3

Bivariate Analysis Result

The bivariate analysis aims to determine the relation of environmental health factors with the incidence of respiratory diseases that exist in under-five children in the working area sub-district health centers Likupang, North Minahasa District, anlysis is using chi square test.

Tabel 8. p-value Result on Environmental Health

Environmental Health	p-value	Explanation
Ventilation	0,782	Not Related
Residential Density	0,139	Not Related
Lighting	0,673	Not Related
Temperature	0,568	Not Related
Humidity	0,268	Not Related

DISCUSSION

Prevalence of ARI

In this study, the under-five children said to ARI and not experience ARI by signs of symptoms such as runny nose, cough, fever, difficulty in breathing that occur within 2 weeks of the last that occurred from the nasal cavity until the bubbles pulmonary acute (moh 2007), From the results of the study 35 children under five in the eastern Likupang sub-districts showed that the incidence of respiratory disease 60% had ARI and 40% had no ARI. ARI can be caused by viruses or as a result of air pollution.

Pulisan is a village that is often impassable to vehicles as the village Pulisan including tourist village because there are white sand beaches and green hills. Due to a village tour which many local and foreign tourists visited enable the air pollution in the village Pulisan.

Environmental Health Factors Relation with Disease incidence ARI in Under-five children.

Environmental Health related with ARI

Serves as a ventilation air circulation and exchange of air in the house. Poor ventilation will cause respiratory health problems on its inhabitants, especially for under-five children. Disease transmission channel they are due because of germs in the house cannot be mixed up and settle so ventilation should qualify Indonesia Ministry of Health No. 1077/Menkes/Per/V/2011 which ventilation 10% of the floor area.

Based on the research conducted, it was found that there was no significant relation between the vent with the incidence of respiratory disease in infants where as many as 10 of the 16 (62.5%) ventilate the house to be ineligible under five suffering from ARI. While as many as 11 from 19 (57.9%) qualified home ventilation and under-five children who are not experiencing ARI. This is because the size of the spacious rooms and occupants are more than four people generally vent communities in rural districts Likupang east disqualify terms of the ratio between the area of ventilation with a floor area.

In research Rahmayatul (2013) and Diana study (2012) found a significant relation between ventilation with ARI in infants. Good ventilation is ventilation placed cross (opposite) as in the northern and southern parts of the house or the side of the left and right of the house. It aims to draw air in cross (cross ventilation) so that the exchange of indoor air can occur well and the air in the house has a good quality (Ismaya et al, 2007).

Qualified residential density is if the floor area divided by the number of occupants is greater than 4 m^2. From Chi square test were conducted, it was found that there was no significant relation between residential densities with ARI incidence in infants. This is due to the number of occupants is slightly more than 4 people.

In a previous study conducted by Diana (2012), found an association between

residential densities with ARI in infants. Likewise Rahmayatul study (2013), where the discovery of the relation between residential density with ARI in infants and Rahmayatul found that residential density is ineligible three times more at risk than residential density are eligible. Transmission of diseases especially those that spread through the air is directly proportional to the density of occupancy of a house. High residential density would worsen air circulation. This would lead to respiratory diseases especially those caused by viruses will be quicker to attack members of the family. The higher the population density of a home, the more easily the transmission of diseases caused by air pollution in infants such as respiratory problems or ARI (Achmadi, 2008).

This study found that the lighting in the house most of the eligible (less than 60 lux). Based on research conducted by the incident light intensity home respiratory disease in infants as many as 12 of 21 (57.1%) Lighting house does not qualify and under five suffering from ARI. While as many as 9 from 14 (64.3%) Lighting house qualified and under-five children who don't experience ARI. Based on results obtained chi square test p= 0.673 (p-value <0.05) thus concluded that there was no significant relation between Lighting home with the incidence of respiratory disease in infants in the village Likupang Eastern Sub-district of North Minahasa District. This is in line with research Junitje (2016), in the study found no significant relation between exposures to ARI in infants that the condition or location of the house in the study affects the measurement of current research. Natural lighting must be determined by the sun, which means the research process or measurement depends also on the weather or the current situation of research.

The air temperature has a very important role; the temperature will affect both directly and indirectly to human life. Room temperature, i.e. in the manufacture of homes to be assured that their construction such that the room temperature does not change much and so that the humidity can be kept do not get too high and too low. To this must be arranged so that the temperature difference between the walls, floors, roofs and window surfaces are not too many. Temperature is the moisture content contained in the large space was measured by using a thermometer with a measurement unit degree Celsius (ºC). The ideal room temperature is between 18-30ºC (Ministerial Decision No. 829/Menkes/Siu VII/1999) on health requirements housing.

The house humidity is eligible if house humidity range of 40-70%. In this study, most of the discount house humidity above 40%. The results of the analysis of the incidence of respiratory disease in infants as many as 8 out of 16 (50%) moisture house does not qualify and under five suffering from ARI. While as many as 13 out of 19 (68.4%) moisture house qualified and under-five children who are not experiencing respiratory infection, which can be concluded that there is no significant relation that the humidity of the house with ARI in infants. this can happen because it is caused by several factors such as ventilation openings and lighting inside the house and within a residential village Pulisan not yet solid. This is in line with research conducted by Rahmayatul (2013), who found that there was no significant relation between indoor air humidity on the incidence of ARI in infants.

CONCLUSION

1. The number of children under-five ARI are 21 persons (60%) and children under-five not ARI are 14 persons (40%).
2. The environmental health factors (ventilation, density occupancy, lighting, temperature, humidity) are not related with the incidence of the disease in infants ARI Working area of District Health Clinics of North Minahasa District East Likupang

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BLOOD LEAD LEVELS (BLLs) ON LEAD-EXPOSED MALE WORKERS

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ABSTRACT
The expansion of industry increases the risk of releasing hazardous substances to the environment. Lead is one of heavy metal that considered to be widely distributed environmental pollutant. Lead is used in several industries such as batteries, accumulators, plastics, etc. The main routes of human exposure to lead through respiratory system, gastrointestinal and dermal contact. The aim of this study was to know the blood lead levels on lead-exposed male workers. The study subjects consisted of 24 male workers who were divided into two different groups. Workers in the first group were lead smelter workers, while workers in the second group were unexposed healthy volunteers as control for comparison. The results indicate the blood lead levels of exposed and unexposed groups between 3.80 - 121.5 µg/dL, the mean of blood lead levels in exposed group was 87.57 µg/dL and the unexposed group was 6,9 µg/dL. These study highlight that average blood lead levels on workers in exposed group has exceeded the Biological Exposure Index (10-25 µg/dL).

Keyword : BLLs, Lead, Exposure

INTRODUCTION

The expansion of industry increases the risk of releasing hazardous substances to the environment. In developing countries, many workers in small industries are exposed hazardous substances. Lead is one of heavy metal that considered to be widely distributed environmental pollutant. Lead is used in several industries such as batteries, accumulators, plastics, etc. The main routes of human exposure to lead through respiratory system, gastrointestinal and dermal contact (Palar, 2008).

Human exposure to lead resulting from the contribution of natural factor is low. However, the extensive use of this metal in various sectors has resulted in a significant increase of its concentration in the environment. Lead can affect the central nervous, cardiovascular and the hematological system (ATSDR, 2007).

The Blood lead levels serves as major biomarker for monitoring environmental exposure of lead poisoning (Ettinger et al, 2010). Research conducted over the past decade has shown that there was statistically significant association of Lead Exposure in low concentrations in the environment with the incidence of renal dysfunction in the population. This study made use of both approaches is a cross-sectional and prospective cohort approach (Navas-Ancien et al, 2009; Ferraro et al, 2010).

MATERIALS AND METHODS

1. Study Subject

The current study location is Tegal Regency, Central Java. All subject blood sampels were collected from people working in the lead smelting sites to investigate their potential exposure to lead. The study sample consisted of 24 male workers who were divided into two different groups. Workers in the first group were lead smelter workers, while workers in the second group were unexposed healthy volunteers as control for comparison.

2. Sample collection, analysis and ethical approval

Blood samples were collected as much as ± 10 cc by phlebotomist, and then the blood sample stored in a cold box and transported to the laboratory for blood lead level's analysis by using Atomic Absorption Spectrophotometry (AAS).

The study was approved by the Health Research Ethics Committee of the Faculty of Public Health Airlangga University (No.73-KEPK). The study subjects were voluntary, they were informed verbally and in writing of the study aims and signed an informed consent form.

RESULTS

Table 1. BLLs between the exposed and unexposed group

Category	Lead (µg/dL)		
	Mean ± S.D	Min	Max
Exposed Group	87.57 ± 18.53	54.4	121.5
Unexposed Group	6.9 ± 3.44	3.8	17.2

The mean of blood lead levels in workers were 47.24 µg/dL, with a range of 3.8 µg/dL - 121.5 µg/dL. Blood lead levels of workers has exceeded the Biological Exposure Index (BEI). According to the World Health Organization (WHO) in adult normal value is 10-25 µg/dL.

The entry of lead compounds in the blood will provide lead compounds dissolved in the blood is carried around the body system. Circulation of blood enters the glomerulus is part of the kidney. The glomerulus is a process of separation of the end of all blood-borne materials. Lead dissolved in the blood will move into the urinary system (kidneys) that can lead to damage to the kidneys. Damage occurs due to the formation of intranuclear inclusion bodies is accompanied by symptoms amnociduria, namely the excess of amino acid in the urine (Palar, 2008).

Lead excretion process which takes place in the kidneys can cause adverse effects on the kidneys. Although the kidney weight is only about 0.5% of the total weight, the kidneys receive blood by 20% - 25% of the cardiac output through the renal artery. The high flow of blood to the kidneys that cause a wide variety of drugs, chemicals and heavy metals in the systemic circulation was sent to the kidneys in large numbers. These toxic substances accumulate in the kidneys and cause kidney damage.

Besides causing direct tubular damage, toxic substances also has the ability to damage the kidney through external effects by influencing the hemodynamic, immunological system, as well as metabolites of a substance. Some toxic substances can alter intrarenal hemodynamics that trigger vasoconstriction. Prolonged vasoconstriction resulting in decreased perfusion pressure, decrease glomerular hydrostatic pressure, decreased GFR and tissue hypoxia due to reduced flow of oxygen and nutrients that the eventual destruction of the tubules. (Schnellman et al, 2001; Kumar et al, 2005).

CONCLUSION

These study highlight that average blood lead levels on workers in exposed group has exceeded the Biological Exposure Index. According to the World Health Organization (WHO) in adult normal value is 10-25 µg/dL.

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THE OCCURRENCE RISK FACTORS OF CHIKUNGUNYA IN KAUMAN HEALTH CENTER PONOROGO REGENCY IN 2016

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ABSTRACT
Chikungunya fever is a type of infection diseases caused by chikungunya virus (CHIKV) which is transmitted by *Aedes aegypti* and *Aedes albopictus* mosquito types with joint pain as an obvious symptom. In 2014 - 2015, the most happening chikungunya case was in Kauman Health Center Ponorogo Regency with 116 cases. This research is to analyze the risk factors of the occurrence of chikungunya in Kauman Health Center Ponorogo in 2016. This research is quantitative analysis with case control as research design. The samples used for case group and control group are 15 respondents each out of 116 population. Sampling technique used in this research is simple random sampling. Research result was analised using Chi-Square Odd ratio to investigate how big the chance of its risks. Regarding to the result of this research, variables which become risk factors are larvae existance (OR=13), closing container (OR=7,562), draining habit of container (OR=7,429), plant existance (OR=5,5), air temperature (OR=1,833), and humidity (OR=1,33). While for protective factors, they are lightening variable (OR= 0,182) and hanging clothes (OR=0,103). Therefore, government and society must cooperate to eradicate mosquito larvae by repairing societies' habits in order to decrease the risk of the occurrence of chikungunya.

Keywords: Risk Factors, Chikungunya, Aedes

INTRODUCTION

Chikungunya fever is an infectious disease caused by chikungunya virus (CHIKV) is transmitted by mosquitoes (Arthopod- borne virus / masquito - borne virus). Chikungunya virus family Togaviridae including alphavirus genus (Kemenkes RI, 2012). In Asia mosquitos transmission occurs in human beings with mosquito vector Aedes aegypti and Aedes albopictus (WHO, 2009). Chikungunya fever is characterized by the appearance of symptoms similar with dengue fever. Distinctive and dominant symptom is joint pain. (RSPI 2007 in research Rumatora, 2011).

Data from the Health Service Ponorogo (2015) states that since 2013, the incidence of chikungunya continues to rise and is in the Kauman district area in Kauman Health Center which amounted to 51 cases which is the highest incidence rate in 2013. In the following year in the region of Kauman Health Center also become the highest incidence of cases of chikungunya is numbered 116 cases. Therefore do research with the aim of analyzing the risk factors of chikungunya in Kauman Health Center of Ponorogo 2016.

METHODS

This research is a quantitative analytic, with the case-control study design is to assess the magnitude of the risk of exposure to disease exposure causes chikungunya in Kauman Health Center Ponorogo in 2016. The research location is in Kauman Health Center area. The population in this study were 116 cases with samples of each case is 15 respondents and 15 respondents is in control groups. The research variables in this study consists of a variable physical environmental factors, biological environmental factors, and behavioral factors. Data was analyzed by Chi-square Odd Ratio

RESULT

Physically Environment Factors

Air Temperature

Tabel 1. Air Temperature Cross Tabulation with The Occurrence of Chikungunya in Kauman Heath Center Ponorogo 2016

Air Temperature	Case	Control	OR (95% CI)
	∑	∑	
Not Qualified	9	11	1,833
Qualified	6	4	
Total	**15**	**15**	

Based on table 1, the statistical test by using chi - square, risk estimate values obtained Odd Ratio = 1.833, indicating that the air temperature inside the house is not qualified have 1.8 times greater risk of chikungunya occurred than air temperature in a qualified home.

Air Humadity

Tabel 2. Air Humadity Cross Tabulation with The Occurrence of Chikungunya in Kauman Heath Center Ponorogo 2016

Air Humadity	Case	Control	OR (95% CI)
	∑	∑	
Not Qualified	9	10	1,333
Qualified	6	5	
Total	**15**	**15**	

Based on table 2, the statistical test by using chi - square, risk estimate values obtained Odd Ratio = 1.333, indicating that the air humadity inside the house is not qualified have 1.3 times greater risk of chikungunya occurred than air humadity in a qualified home.

Lightening

Tabel 3. Lightening Cross Tabulation with The Occurrence of Chikungunya in Kauman Heath Center Ponorogo 2016

Lightening	Case	Control	OR (95% CI)
	∑	∑	
Not Qualified	10	4	0,182
Qualified	5	11	
Total	**15**	**15**	

Based on table 3, the results of statistical test by using chi - square, risk estimate values obtained Odd Ratio = 0.182, indicates that the lightening was a protective factor that has the effect of preventing the occurrence of chikungunya.

Environment Biological Factors

Plant Existance

Tabel 4. Plant Existance Cross Tabulation with The Occurrence of Chikungunya in Kauman Heath Center Ponorogo 2016

Plant Existance	Case	Control	OR (95% CI)
	∑	∑	
Not Exist	4	10	5,5
Exist	11	5	
Total	**15**	**15**	

Based on table 4, the results of statistical test by using chi - square, risk estimate values obtained Odd Ratio = 5.5, indicating that the existance of plants around the house has a 5.5 times greater risk of chikungunya occurred than not exist plants around the house

Mosquitos Larvae Existance

Tabel 5. Mosquito Larvae Existance Cross Tabulation with The Occurrence of Chikungunya in Kauman Heath Center Ponorogo 2016

Larvae Existance	Case	Control	OR (95% CI)
	∑	∑	
Not Exist	5	13	13,00
Exist	10	2	
Total	**15**	**15**	

Based on table 5, the statistical test by using chi - square, risk estimate values obtained Odd Ratio = 13.00, indicating that the larvae existance have a 13 times greater risk of chikungunya occurred than not existance larvae.

Behavioral Factors

Drain Container Habit

Tabel 6. Drain Container Habit Cross Tabulation with The Occurrence of Chikungunya in Kauman Heath Center Ponorogo 2016

Drain Container Habit	Case	Control	OR (95% CI)
	∑	∑	
Tidak	8	2	7,429
Ya	7	13	
Total	**15**	**15**	

Based on table 6, the statistical test by using chi - square, risk estimate values obtained Odd Ratio = 7.429, indicating that the habit does not drain the container has a 7.4 times greater risk of chikungunya occurred than have a habit of draining container.

Closing The Container Habit

Tabel 7. Closing The Container Habit Cross Tabulation with The Occurrence of Chikungunya in Kauman Heath Center Ponorogo 2016

Kebiasaan Menutup TPA	Kasus	Kontrol	OR (95% CI)
	∑	∑	
No	11	4	7,562
Yes	4	11	
Jumlah	**15**	**15**	

Based on table 7, the statistical test by using chi - square, risk estimate values obtained Odd Ratio = 7.562, indicating that the habit of not closing the container had a 7.5 times greater risk of chikungunya occurred than have the habit of closing the container.

Hanging Cloth Habit

Tabel 8. Hanging Cloth Habit Cross Tabulation with The Occurrence of Chikungunya in Kauman Heath Center Ponorogo 2016

Kebiasaan Menggantung Pakaian	Kasus	Kontrol	OR (95% CI)
	∑	∑	
Tidak	2	9	0,103
Ya	13	6	
Jumlah	**15**	**15**	

Based on Table 8, the results of statistical test by using chi - square, risk estimate values obtained Odd Ratio = 0.103, indicating that the habit of hanging clothes was a protective factor which has the effect of preventing the occurrence of chikungunya.

DISCUSSION

Physical Environmental Factors

Air Temperature

Temperatures are not eligible to have 1.8 times greater risk of chikungunya occurs because the air temperature chikungunya vectors can still survive. This is supported by research Susanti, L, et al (2013), the temperature is not eligible may affect the development of the virus in the body of the mosquito. Measurements obtained a relatively high temperature is 29^{o}C - 31^{o}C. This is influenced by the time of measurement and at the time of the case, in kauman health center,the rainfall is relatively small (rare rain) even though it was the rainy season.

According to the epidemiological triangle approach, the imbalance between the environment, agent, and host can cause the appearance of a disease. Research Fischer, D, et al (2013) showed that the higher the temperature will speed up the external incubation period of chikungunya vectors. This means that make it faster the external incubation period. Its mean that transmission to the host will be faster.

The high temperature in endemic Chikungunya area, it caused by rainfall in those area so relatively small (rare rain) even though it was the rainy season. Countermeasures development of a vector for their climate change carried out by a climate mitigation strategy (Fischer, D, et al 2013).

The next factor that causes the temperature does not qualify with fewer maximize the function of the window. Besides the arrangement of rooms in the house that is less structured led to the house smells musty.

Air Humadity

The humidity is not eligible of chi - square at risk 1.3 times greater than the humidity occur chikungunya eligible. This is because the humidity> 70% humidity are comfortable for mosquito development. Mosquitoes prefer to breed and survive in homes with high humidity> 70%. In addition, research Rumatora (2011), states that the humidity is not qualified can extend the life of the mosquito to become infective chikungunya because of a stomach virus mosquitoes have time to move to the salivary glands of mosquitoes.

Lightening

The results of measurements of the chi - square showed that the lighting in Kauman health center Ponorogo in 2016 was a protective factor with OR = 0.182 where these factors can prevent the occurrence of new chikungunya if the lighting in a room in a condition to qualify. In harmony with the research Santoso (2011), the result of OR = 0.441 namely lighting as a protective factor.

Environmental Biological Factors

Plant Existance

Herbaceous plant that grows in the group of cases is not maintained so that the house looks closed by shrubs that block the sun's light into the house. The existence of plants around the home of Chi - square showed OR = 5.5 which shows that have 5.5 times greater risk of chikungunya occurred than not their plants around the house. Their plant shrubs or bushes around the house a risk of chikungunya. According to Santoso (2011), shrubs are the preferred place for mosquitoes to perch and rest.

Mosquito Larva Existance

The results of the chi-square statistic test obtained OR = 13, shows that the presence of larvae in the home of respondents had risk 13 times greater than the absence occurs chikungunya mosquito larvae in the home of respondents. From the behavior of respondents who do not have the habit of closing the drain and water reservoirs led to high rates of the existence of larva that were 13 times more likely happen is consistent with research chikungunya. N.Kunthi and Taliah (2011) research, the presence of larvae in the landfill in the house risky one, 4 times bigger occur chikungunya and presence of TPA outdoors 4.7 times greater risk of chikungunya occurred. This is because the Aedes mosquito breeding places have a main place - a place that provides clean water to spawn until it turns into a pupa and become adult mosquitoes, so that if the existence of this flick left to the risk of chikungunya back is huge.

Behavioral Habit

Drain Container Habit

In this study, the chi-square statistic test, OR = 7.4 which indicates that respondents who do not have the habit of draining TPA 7.4 times greater risk of chikungunya occurred back than respondents who have a habit of draining water reservoirs. In harmony with the research Sari, WP (2015), does not have the habit of carrying out the drainage water reservoirs had 10.26 times greater risk of suffering from chikungunya than samples that did draining properly.

Closing Container Habit

On the results of the statistical test Chi - Square obtained OR = 7.5 which indicates that respondents who have a habit of not closing the landfill had a 7.5 times greater risk of chikungunya occurred than respondents who have a habit of closing the landfill. This research is in line with research Santoso (2011), who obtained the results of a significant relationship between the habit of closing the water reservoir with an incidence of chikungunya with p value 0.003 (<0.005) and the value of OR = 4.167. This indicates that the sample is not in the habit of closing the water reservoirs have 4.16 times greater risk of suffering from chikungunya than samples which have a habit of closing the water reservoirs. Having the habit of interpreting their efforts to prevent the vector of chikungunya which will berhabitat and breed.

Hanging Clothes Habit

The results of the statistical test Chi - Square obtained OR = 0.103 which shows that the habit of hanging clothes are protective factors that have an influence on the occurrence of chikungunya prevention. The habit of hanging clothes in this study included a protective factor. In the control group mostly not hang clothes after completion worn, but after wearing incorporated directly into the sink so that mosquitoes do not have the opportunity to rest on a clothes hanger. This is different from the cases that have a habit of hanging clothes.

CONCLUSION

The risk factors of chikungunya occurrence in Kauman Health Center Ponorogo 2016 from physical environmental factors are temperatures with OR = 1.833 and humidity with OR = 1.333. Lighting with OR= 0.182 is a protective factor for the occurrence of chikungunya in Kauman Health Center Ponorogo 2016. From biological environmental factors are the existence of plants with OR = 5.5 and the mosquito larvae existance with OR = 13.00 . From behavioral habits, the habit of draining container with OR = 7.429, the habit of closing the container with OR = 7.562 are risk factor for chikungunya Kauman Health Center Ponorogo 2016. Hanging clothes habit with OR = 0.103 is a protective factor for the occurrence of chikungunya in Kauman Health Center Ponorogo 2016.

The suggestion for local government that governments should be participated and support the alleviation of chikungunya in a way: Moves all elements associated with chikungunya cases such as the Department of Health, Department of Public Works, Human Settlement and Environment Agency for togetherness contribute in improving the environment and the eradication of mosquito breeding. Reviewing and directly oversee the implementation of the mosquito eradication and environmental improvement. For another researcher, they need to do further research on vector surveillance relationship with the transmission of chikungunya disease after an unknown factor - a risk factor that causes chikungunya.

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THE FIRST PILLARS IMPLEMENTATION OF COMMUNITY LEAD TOTAL SANITATION PROGRAM IN RIVERSIDE AREA, DAWUHAN VILLAGE, SITUBONDO

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ABSTRACT
In 2006, ISSDP study result showed that Indonesian people are still behaving defecate in the open environment as much as 47%. East Java Province is a major concern in the acceleration of CLTS program because it is one of the lowest CLTS village percentage. Situbondo is one of regency in East Java with the lowest number ODF verification. Situbondo Sub District is one of district with the second largest population with healthy latrine ownership percentage of 45.96% and Village Dawuhan become one of the village with the highest open devecation behavior. This study aimed to analyze the first pillars implementation of CLTS program in riverside area, Dawuhan Village, Situbondo. This research was conducted with a cross-sectional design with quantitative descriptive approach. The results showed that the latrine ownership society has not reached 100%. In addition, the flow of sludge removal from the pit straight to the river flow still found in riverside area. Most societies have means of healthy latrines at home with a clean latrine room condition, free of feces and vector-borne diseases such as cockroaches and flies, and have been quipped with facility of hand-washing with soap. A total of 24.2% of the people who are living along riverside in Dawuhan defecate in the river, most of them are female. It is concluded that the first pillar implementation of CLTS program in riverside area, Dawuhan Village, Situbondo is still less than maximum to achieve ODF status because some of the first pillar indicators still has not been reached.

Keywords: Open Defecation Free, Riverside Community, Defecation Behavior

INTRODUCTION

The proportion of behavior Open Defecation (OD) in Indonesia was ranked second highest after India as many as 58 million people who are still doing the behavior of OD (WHO, 2010). ISSDP study results in 2006 showed the Indonesian people are still behaving defecate in addition to a healthy latrines them into rivers, fields, pools, gardens and open environment of 47% (Ministry of Health, 2008). The Government of the Republic of Indonesia issued a policy in addressing the environmental issues that could potentially lead to the transmission of disease to society, namely Ministry of Health Republic of Indonesia Number 3 of 2014 on Community Lead Total Sanitation.

National strategy of STBM is concerted action to reduce the incidence of infectious diseases including diarrhea-based environment, as well as improving hygiene behavior and quality of life of Indonesian society (Dirjen PL, 2013). STBM program consists of five pillars, but the main focus on Stop Open Defecation pillar which is the entrance to total sanitation as well as an attempt to break the chain of human fecal contamination of the raw water to drink as well as food. The program is conducted by the method of triggering stop Open Defecation to society to decrease the behavior of Open Defecation people.

The Government of the Republic of Indonesia sets East Java included in the three provinces with villages STBM still low based on the number of villages are 8000 villages

(Dirjen PL, 2015). Based on data from national monitoring cumulative verified ODF district in the province of East Java in 2006-2014, showed that Situbondo is a district with a percentage of the most triggered villages but the number of villages ODF lowest verified. Based on the data Health Office in 2012-2014, it is known that an increasing number of villages claim ODF or status villages ODF yet verified by the verification team in Situbondo happening quite slowly over a period of 2 years which amounted to 3.68% (Health Office of Situbondo, 2015).

Situbondo Districts government center with the second most populated after the Besuki Districts is 1723.03/km^2 and percentage of ownership of basic sanitation facilities such as latrines healthy is significantly lower at 45.96% in 2012 when compared to the Besuki Districts (Health Office of Situbondo, 2013). Village of Dawuhan is one sub-districts in the Situbondo Districts to population, the number of permanent healthy latrines were awakened, and the number of OD behavior most when compared with 5 villages or other villages (health Situbondo, 2015).

The research problems are how the results of the first pillars implementation of Community Lead Total Sanitation program in riverside area, Dawuhan Village, Situbondo? This study aimed to analyze the first pillars implementation of Community Lead Total Sanitation program in riverside area, Dawuhan Village, Situbondo.

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METHOD

This type of research is descriptive observational research, with cross sectional study design. Location of the research done at Dawuhan, Situbondo District, Situbondo. The study population that is populated by 4,024 households. Samples citizens taken using multistage random sampling to obtain the number as many as 124 people.

The primary data obtained from interviews structured to people using an open questionnaire and observations using the observation sheet scanned the pit owned by residents in homes and defecation behavior of residents in the village river flow Dawuhan. Secondary data were collected in the form of a general description and the number of Healthy Latrine Permanent Dawuhan, Situbondo District, Situbondo.

Collected data through the process of editing and coding, then made entry and proceed with the cleaning data. The data collected were processed and analyzed by descriptive quantitative data analysis techniques to describe the circumstances of a region based on interviews and observations environments. The results of data processing are presented in tabular form. This study has received approval from the ethics committee of the Faculty of Public Health Airlangga Universittas Number 122-KEPK.

RESULT AND DISSCUSSION

Overview Dawuhan Village

Dawuhan Urban Village is one of the villages in the district of Situbondo. Dawuhan urban village is a village with the largest population in the district of Situbondo. The population of the village Dawuhan as many as 17.231 people in 4,024 households. Number of male population as much as 8619 people and the number of females as many as 8,602 people. Dawuhan consists of 4 sub-districts which includes Parse, Krajan, Paaraman Hamlet, and Dam by the number of RW is 17 and the number of RT is 72 (Nurika, 2015).

Community characteristics

Community characteristics obtained from interviews of citizens is the target acceleration program ODF villages the residents who live along rivers Dawuhan,

Situbondo and proven by the Family Card. The community characteristics include levels of education, employment, and income. The education level of residents in the Dawuhan presented in Table 1.

Table 1. Education of Residents in Dawuhan, Situbondo 2015

Level of Education	Total (people)	%
Tidak sekolah formal	21	16,9
SD	44	35,5
SMP	23	18,5
SMA	28	22,6
SMK	5	4,0
Universitas/Akademi	3	2,4
Total	**124**	**100,0**

Most of the residents studied last in elementary school (SD) and high school. Jobs residents in Dawuhan presented in Table 2.

Table 2. Residents Job in Dawuhan Situbondo 2015

Job	Total (people)	%
Tidak bekerja	84	67,7
Pedagang	20	16,1
Pembantu rumah tangga	9	7,3
Swasta	6	4,8
Lainnya	3	2,4
Petani (sawah/ladang)	1	0,8
PNS	1	0,8
Total	**124**	**100,0**

Most residents in Dawuhan, Situbondo do not have a job. Residents who do not have jobs and the majority of women as housewives. Income residents in Dawuhan presented in Table 3.

Table 3. Residents Income in Dawuhan, District, Situbondo 2015

Income	Total (People)	%
< Rp. 1.107.000,00	101	81,5
≥ Rp. 1.107.000,00	13	18,5
Total	**124**	**100,0**

Most of the residents had a monthly income of less than Rp. 1,107,000.00 or less than the Minimum Wage district or city (UMK) in East Java Governor Regulation No. 78, 2013 concerning Minimum Wage District Municipality. The income level of most of the residents are low in Dawuhan make citizens more priority to meeting basic needs of daily and override the fulfillment of minimum basic sanitation are healthy latrines. Knowledge is a critical component for the formation of a person's actions in doing PHBS one of them

build healthy latrines and sanitation facilities do defecation only in healthy latrines (Taosu and Azizah, 2010).

Healthy Toilets Access

Number of toilets to healthy can be demonstrated by the number of Permanent Healthy Latrine owned by residents in the Dawuhan. Permanent Healthy Latrine has been increased since the number of 3 last year for the years 2012 to 2014. The number of Permanent Healthy Latrine belonging to residents in Dawuhan, Situbondo presented in Table 4.

Table 4. Number of Permanent Healthy Latrine of Residents in Dawuhan, Situbondo

Year	Total (Home)	Permanent Healty Latrine	%
2012	3886	2618	67,37
2013	3886	2618	67,37
2014	3886	3250	83,63

Number of Permanent Healthy Latrine in 2012 and 2013 did not change, whereas in 2014 there has been a change in the number of Permanent Healthy Latrine is increased to more than 10% in one year.

Based on the research results, the majority of residents in Dawuhan have private toilets in the amount of 74.2%. This amount is to describe citizens access to latrines amounted to 74.2%. Type pit owned by the citizens of most of the squat toilet is kind of a swan's neck, however, the percentage of citizens who do not have latrines are also quite large, amounting to 25.8%. Residents who do not have latrines that do defecate by way ride (sharing) with neighbors, using public toilets and most residents practice of open defecate in the open, especially in the river and in the gutter / ditch.

According to Geeta and Kumar (2014), community empowerment needs to be done to change people's behavior for the better, but empowerment is an activity that is not forever, but until society is able to perform independently and monitored from a distance so as not to fall back. Event triggered stop open defecation in CLTS during this time as well as development activities is to trigger disgust, shame, fear of pain, fear of sin, guilt, self-esteem, and the cost of illness to be incurred as a result of the behavior of people who are not hygienic defecate in healthy latrines but in the open (Dirjen PL, 2013). Once residents feel motivated and feel the need for the fulfillment of sanitation facilities people are required to establish a healthy latrine means that independently. How that can be done in the construction of latrines when people's income included daalam the lower middle class that cooperate together with other citizens to build toilet facilities general, by organizing a social gathering latrine or by way of credit privy to the agency has been working closely with local government the aim of meeting the needs of basic sanitation latrines healthy communities throughout the district. After a healthy latrine sanitation facilities awoke, the public will be directed to the use and maintenance of healthy latrines to the fullest.

According to Jenkins, et.al (2014) and Pfadenhauer and Rehfuess (2015) to be able to change people's behavior is more hygienic latrines with defecate only in healthy is not an easy thing because people's behavior has become a habit takes a long enough time to be changed, ranging from introductory stages, the increasing need to be able to make requests of citizens to meet the needs of basic sanitation. Improved sanitation needs of the citizens

will be able to walk to the purpose if the facilitator and cadres engage community leaders, religious leaders, or people who influence the decisions of citizens.

Sanitary Latrines And Room Toilet

Latrines are owned by people with type squat toilet or latrine sitting goose neck goose neck, most have been fitted with a distribution of sanitary effluent end of feces that is, toward a septic tank. The percentage of residents who equip buildings with a private toilet discharge end distribution of feces in the form of a septic tank 92.4%, however, there are the residents did not complete a private toilet with a discharge end of faeces sanitary distribution. Faeces from toilets is channeled toward a body of water or rivers that are near homes.

Based on the research results, hygiene in the room toilet / WC belong to citizens who assessed include component cleanliness of the floor and walls of the pit, where the vector cockroaches and flies as well as the availability of water and a dipper / sprinklers are functioning. Most of the room toilet / WC belonging to residents in Dawuhan, Situbondo in pristine condition is the floor and walls of the pit is free of feces with a percentage of 88.3%. In addition, most of the room toilet / WC is used by people to defecate is free from cockroaches and flies with a percentage of 88.3%. Most of the room toilet / WC citizens with goose neck type squat toilet is equipped with a scoop and water to flush the feces after defecating. As for the toilet room / WC citizens with the kind of toilet sitting goose neck has also been equipped with sprinklers that still works to clean the feces after defecating. Overall condition is obtained at the time of the observation room toilet / WC is used by people (Nurika, 2015).

Defecation Behaviour Of Community

Most of place of the people who have grown if you want the highest defecate is in private latrines. Where people who have grown up if you want to defecate in the Dawuhan, Situbondo presented in Table 5.

Table 5. Defecate Points of Residents In Dawuhan Situbondo

Defecate Point of Family Mamber	Total (Household)	%
Private latrine	92	74,2
River/sea/sewer	30	24,2
Public latrine	2	1,6
Total	124	100

Most people do not defecate in latrines personally choose to defecate in toilets / latrines, or defecate in open places such as rivers and ditches. Residents choosing to defecate in the open like rivers and ditches have a high enough percentage value. Most Dawuhan residents who do not have it and can choose to defecate in the open environment are adult women and men.

In this study, there were 37.1% of citizens who have children of 0-5 years in the home, but only a fraction toddlers often defecate in the floor, in the garden, on the street, in the gutters / drains or rivers. Habits of citizens when disposing of feces has been throwing toddler largely to the toilet / WC with a percentage of 73.9%. Most other residents as many as 26.1% of toddlers dump sludge in the river / ditch / sewer / coast.

Along the river flow Sampean flowing Dawuhan neighborhood, they found people who do not use latrines or defecate in the river behaves. Characteristics of a common citizen is a citizen of adult women. Adult women have important roles in the household, especially women who have children. According Taosu and Azizah (2013), hygienic behavior and sanitary mothers that includes defecate behavioral and washing hand with soap behavior just before eating, before processing and serving food, before feeding, before feeding a toddler, after a bowel movement or urination, and after holding the animals or poultry may affect the incidence of infant diarrhea. This is also supported by Humphrey (2009), Mufida (2012), Lindayani and Azizah (2013), and Putranti and Sulistyorini (2013) which states that there is a relationship between the use of toilet with the incidence of environment-linked diseases such as diarrhea. According to Graham and Polizzotto (2013), residential neighborhood with most residents have basic sanitation facilities such as latrines minimal underutilized can pollute the environment and has the potential to cause fecal oral diseases such as diarrhea.

The existence of human feces are still found in the environment, especially in streams flowing in 4 sub-districts in Dawuhan, Situbondo in the last 1 month. This is consistent with the observation of the environment carried out during two weeks of the existence of feces mainly in the river at 4 sub-districts in Dawuhan, Situbondo. Human feces are still visible at several points along the river that are in the Dawuhan neighborhood. Invisibility of human feces in Parse more often when compared to three other villages namely Krajan, Paaraman and Dam.

CONCLUSSION

The first pillar implementation of CLTS program in riverside area, Dawuhan Village, Situbondo is still less than maximum to achieve ODF status because some of the first pillar indicators still has not been reached. The percentage of people who do not have healthy latrines in this study is still quite high and most of the residents do defecate in the open environment. Kind of healthy latrines shared by most of the residents are goose neck squat toilet with feces disposal flow to the septic tank and the sanitary conditions are good toilet room which includes cleanliness of floors and walls, the presence of the vector, as well as the availability of water and a dipper / sprinklers are functioning. Interviews and observations in this study still showed that the percentage of citizens who behave defecate in the open is still quite high.

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HEAVY METAL CONTENT ON MICRO CALSIUM OF BLOOD CLAM SHELL (Anadara Granosa Linn)

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ABSTRACT
The development of coastal areas quite rapidly with a variety of activities, such as maritime services such as port for shipping and fisheries as well as il.cactivities around the coast such as residential, industrial, business and aquaculture. The presence of heavy metals in waters, either directly dangerous to the life blood clam (Anadara Granosa Linn) as well as indirect effects on human health. This study aims at analyzing the content of heavy metals Hg, Pb, Cu and Cd in mussel shells which are made into micro calcium. Shellfish samples taken at the location of the shellfish market in Kenjeran market Surabaya. The results showed that the metal content of Hg= 38 ppb , Pb= 0,4 ppm, Cu= 0,4 ppm and Cd = 0,05 ppm. The heavy metal content still meets the quality standards set by the FDA of Indonesia so that the blood clam shells (Anadara Granosa Linn) safe to be used as a micro-calcium food supplement.

Keywords: heavy metal Hg, Pb, Cu dan Cd, clam shell (Anadara Granosa Linn), Kenjeran Market Surabaya

INTRODUCTION

The presence of heavy metals in waters, either directly harmful to living organisms, as well as indirect effects on human health. This is related to the properties of the heavy metals which is difficult to degrade, making it easy to accumulate in aquatic environments and their presence naturally difficult to decompose (omitted). Accumulation in organisms including shellfish and fish will harm human health which consume the organism (Marganof, 2003).
When the coastal environment suspected to be affected directly due to degradation of water and sediment in coastal environments is one type of shellfish. Shellfish is one of biota that can be used as a biological parameter in determining the condition of a body of water. Clam shells (Anadara Granosa Linn) is one commodity that is widely available in estuaries. The shells used for various purposes including as a food source of protein (Dharma, 1988).

Shellfish can accumulate more metals than other aquatic animals because it is its food settle and filter feeders and it is not easy influenced by pollution. Therefore, the type of shellfish is an excellent indicator for monitoring a metal pollution in aquatic environments (Darmono, 2001).

Calcium is one of the essential mineral that plays an important role in the body is a major component of bone and teeth formation. Consume less calcium will cause the bones and teeth become brittle and easily broken or called osteoporosis. At an advanced age, calcium is lost from the body is greater than the calcium is absorbed. Based on the results of data analysis the risk of osteoporosis by the Ministry of Health Nutrition Research, Indonesia, there are two of five people at risk of osteoporosis. It is also supported by the White Paper issued by Indonesian Indonesian Osteoporosis Association (Perosi). In 2007, osteoporosis in women over 50 years to reach 32.3%, while in men over 50 years to reach 28.8% (Ministry of Health, 2009).

Common sources of calcium are milk consumed by the public, while other calcium sources are yet to be explored is the source of calcium from the water. One of the aquatic

animals as a source of calcium that will be examined is the shell of shellfish types, namely clam (Anadara granosa Linn) which is one type of mollusk that has a high economic value and widely used by the public as an alternative food source. Good sources of calcium as a supplement itself is still a lot of imported, whereas a natural source of calcium is found in many marine animals, especially the crustaceans such as crabs and shrimp. Calcium is generally consumed in the form of macro contained calcium. The particle size of calcium is associated with the absorption of calcium by the body. The size of the macro can be absorbed only 50% so often cause deficiencies. Formation of calcium technology smaller size need to be developed to increase the absorption of calcium in the body. Formation technology needs to be developed that measure calcium is micro and nano technologies. Micro and nano calcium has a very small size that is 10-6 and 10-9 m which causes rapid receptor into the body perfectly and calcium can be absorbed by the body almost 100% (Suptijah, 2009). Micro-and nano-sized calcium spread in the body than calcium-sized macro. Reduce the size of the mineral calcium into smaller would make direct absorption by the cells become more perfect. More stable, can be used in particular in the cell layer, spread through the lymphatic system, high bioavailability, low toxicity. Because the body processes slow then separated into smaller doses and frequency of drinking becomes less than that is mainly aimed at the body's immune system.

Utilization of waste invertebrates (crustaceans) as a source of calcium for bone compatible animal, using nano-technology is a breakthrough blend worthy to follow-up. Calcium carbonate naturally is in two main forms or polymorphs in the form known as aragonite and calcite. Aragonite is found in cosomata pteropods (marine snails group and coral reefs) are calcite commonly found in animal coccolithophores and foraminifera. While the two groups of mollusks commonly use these forms. The following figure shows how aragonite easier to react because it is in the form of meta-stable than the form of calcite (Yulia V. Nelyubina and Konstantin A. Lyssenko, 2012).

Blood clam (Anadara granosa Linn) is one of the many types of shells found in Indonesian waters. Shellfish is widely consumed by the public because it contains a lot of protein. The number of shells are abundant enough to be comparable to the amount of waste during skin is mostly thrown away and only a small portion is used as animal feed, raw materials for cosmetics, and traditional handicrafts. Waste shells containing chemical compounds that are the pozzolan lime (CaO) was 66.70%, alumina, and silica compounds (Jovita Tri Murtini; Farida Aryani 2005 and Md Zuki Abu Bakar, 2013).

The blood clam shell production has increased every year, but this increase was not accompanied by the utilization of 88.90 tons of waste in 2013 than in 2008, which only amounted to 67.90 tons (Fisheries Statistics of Marine and Fisheries in Figures 2013). Taking into account the purposes of the protection of human health, it is necessary to investigate the heavy metal concentrations of mercury (Hg), Pb (Plumbum), Cu (Cuprum) and Cd (cadmium) in the blood clam shells (Anadara granosa) are made into micro calcium in Kenjeran Market Surabaya becomes a producer of blood clam shells.

RESEARCH METHODS

Sampling of blood clam shells (Anadara granosa Linn) conducted in Surabaya Kenjeran Market, where all the blood clam catches of various fish auction place along the North Coast of Java both in Surabaya and Sidoarjo eventually sold in this market. On the Market Kenjeran Surabaya is also a place for stripping the shells, because the shells are generally sold to consumers in the form of shells peeled.

Production of Micro calcium

The first stage is the stage of preparation of raw materials and production micro calcium with the following procedure shell flour soaked in 1N HCl for 24 hours. Shells that had been soaked HCl and then extracted at a temperature of 90 ° C. Results of extraction is then performed filtering with filter paper to obtain fluid/filtrate.

Calcium crystal formation is done by the method of precipitation through the gradual addition of 3 NaOH solution ionic dropwise to the filtrate until precipitation of saturated potassium hydroxide (Ca (OH) 2). Next step is the process of separation and neutralization crystal crystal by using distilled water. Crystal (Ca (OH) 2) and then neutralized. The crystals were then roasted at 105 ° C until the weight stabilized sludge, then the crystals are burned using an electric stove to remove the organic content. Furthermore dipijarkan crystal in the furnace at 600 ° C for 6 until formed calcium oxide (CaO), then the extracted crystal smoothed with mortar.

Testing of heavy metals in the blood clam shells (Anadara Granosa Linn) conducted in Unit Testing Services Faculty of Pharmacy, University of Airlangga. Methods of measurement of heavy metals using Atomic Absorption Spectro-photometry (AAS) that is based on the measurement of the evaporation of the sample solution, then the metal contained in them is converted into free atoms (Hutagalung et al, 1997 and Flat and Suptijah, 2012).

RESULTS AND DISCUSSION

Heavy metals contained in the North Coast of Java can be derived from domestic sewage, industrial, agricultural and marine transport activities as well as coming from a growing urban activities around these waters. Waste from factories along the banks of Kali Wonokromo, Kali Wonorejo, Kali Dadapan, and Kali Keputih which empties into the North Coast of Java as Kenjeran Coast Surabaya is the main cause of pollution (Fathurrofiq, 2009).

TABEL 1. Research Result

Kind of Metal	Concentrat
Pb	0,4 ppm
Cd	0,05 ppm
Cu	0,4 ppm
Hg	1,3 ppb

Heavy metals present in the water body will experience the process of deposition and accumulates in sediments, then accumulates in the body of marine life in the waters (including shellfish that are sessil and as bio-indicators) either through the gills or through the food chain and ultimately to humans.

Blood clam shell (Anadara granosa Linn) is able to absorb contaminants (heavy metals) in an attempt to balance the unbalanced environmental conditions due to the presence of contaminants (heavy metals). The rate of accumulation of Cu, Cd and Zn in response differently by each species of macro fauna were found at the study site (Bede Emeka Udechukwu, Ahmad Ismail, 2013). The highest Cu accumulated by species Nassarius globosus, metals Cd by Anadara scapha (large) and Zn metal by Saccostrea cucullata. All three of these species could be an indicator species in each metal, and can be used as a bio-indicator species typical for each heavy metal (Fichet et al, 2004). This phenomenon is known as bioaccumation or biomagnification (Dahuri et al., 1996).

According to Darmono (2001), the group of heavy metals that are strongly associated with industrial processes are: Mercury (Hg), Cadmium (Cd) and Plumblum (Pb). There are

three types of mercury that have a nature that is toxic to the human element mercury (pure mercury), the form of inorganic salts and organic salt form. Form of inorganic Hg can form mercury (Hg2 +) and form merkuro. Organic forms of Hg such as aryl, alkyl, and alkoxy alkyl highly toxic among other salt forms.

The results of the analysis of the metal content of Pb in the blood samples of mussel shells can be seen in Table 1 where indicated that Pb levels in the blood, including low shells, because according to Anonymous (2005 b), the concentration of metallic lead is considered hazardous if it has crossed the line 0.5 up to 1 ppm. However, the presence of metallic lead in the blood clam shells should be wary because of the metal lead is a heavy metal that is cumulative in the body tissue.

Pb detected can be caused by several things: the existence of diesel waste originating from fishing vessels and waste disposal fertilizers from agricultural activities in the surrounding community. Contaminant source lead (pb) is the largest human-made petrol beraditif lead to fuel motor vehicles (Astawan 2009 in Mrajita, 2010). Furthermore Doelsch et al. (2006).

The presence of Cu in water can be caused by the contamination of agricultural activities, classified as metals which are present in nature as a result of volcanic activity and agricultural activities in which the elements Cu used in the manufacture of pesticides. Addition of Cu probably derived from the activity of the dock, transportation fishing and shipbuilding. Clark (1989) stated that the heavy metals Cu used in wood preservatives and anti-rust paint on the hull.

Origin of metal Cd in these waters suspected of waste plastics, paints on fishing boats and diesel spills at sea. It is as said Hutagalung and Razak (1982) in Mrajita (2010), that the cadmium in nature usually come from industrial waste metal, plastic, paint, fertilizer and oil. Additionally Friberg and Elinder (1992) in Mrajita (2010) said atmospheric dust influx contributes to Cd waters.

Cadmium and its salts are widely used in the form of some kind of factory for the production process. Industrial metal plating factory which is most widely used as a pure Cadmium coatings, as well as a factory that makes Ni-Cd batteries. Cd salt form is widely used in the photographic process, a mixture of glass and silver, the production of photoelectric, photo conductor, and phosphorus. Cadmium acetate is widely used in industrial processes porcelain and ceramics.

CONCLUSION

The conclusion of this research is the blood clam shells still eligible based on FDA Regulation of Republic of Indonesia No. HK.00.06.1.52.4011 2009 on Determination of Limit of Microbial Contamination In Food And Chemical. So it is still safe to be used as an alternative source of calcium

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POLLUTANT LOAD OF DETERGENTS IN TAMBAK WEDI URBAN VILLAGE, KENJERAN SUBDISTRICT, SURABAYA CITY IN 2014

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ABSTRACT

The increasing use of detergents as cleaning agents in the community potentially result in pollution of the water environment, this is supported by the quality of the well water having a high mineral hardness. When cleaning agents flow into waters through the river, it had a negative impact on the environment and health. The results showed that pollutant loads actually came from the use of detergent in 55 households at 0,323 mg/lt/month or 5,924 mg/day, while the standard maximum pollutant load of detergent waste at 0,0016 mg/lt/month or 0,0292 mg/day. The results concluded that the pollutant load value in this research was higher than maximum pollutant load value, suggesting that pollutant load of detergent waste provided high contribution to pollution of the land and waters in such area, thereby the surface water quality decreased ground water quality, incidence of some disease such as diarrhea, heavy metal poisoning and skin disease. Therefore, it is recommended that households use environment-friendly detergents because it is easier to biodegrade. They should make simple domestic waste treatment equipment using biofilter technique.

Keywords : Pollutant load

INTRODUCTION

Background

Detergents is one of the cleaning and material pollution which widely used by domestic and industrial , in many kinds of and volume. Detergents category material the polluter from non point source, that is a source of pollution could not known for certain known for example captives whom i have caused from households , agricultural , sedimentation and materials the polluter other hard traced the source (ARMS, 1990 in Susana and Suyarso, 2008 : 117-131). The use of detergents in people will be better along with the community income, seen from the use of detergents per capita in line with the gross domestic product (GDP) every year. Increase community income , then the detergent consumption also increased. Statistics years 1998, detergents consumption per capita is 1,97 kg on 1998 and 2,46 kg on 1997, but with the improvement of people's purchasing power detergent consumption increased to 2,11 kg on 1999, 2,26 kg on 2001 and 2,32 kg on 2002 (Bisnis Indonesia ; 2004).

Brackish water is water that have salinitas between 0.5 ppt s/d 17 ppt . This water many units in some regions like the estuaries (meetings sea water and fresh water) and coastal regions. Groundwater mixed by sea water contain many minerals like: Calcium Carbonate (CaCO3) , Magnesium Carbonate (MgCO3) , Calcium Sulphate (CaSO4) , Magnesium Sulfate (MgSO4) and so on. Mineral contained in brackish water caused by the sea water that contact with the rocks so that the water was widely containing minerals. Lots of water containing minerals calcium and magnesium known as hard water, namely water which is hard to use wash. Mineral hard water as ion Ca and Mg can react with anion soap , which would lower efficiency cleansing so it takes soap more to wash (Effendi, 2003),

those compounds of calcium and magnesium relatively difficult to soluble in water , then tend to form the sediment or precipitates which finally become a crust.

The result of preliminary survey conducted , Head of Tambak Wedi Urban Village, Musdar, S.E said that although the majority of the community in Tambak Wedi Urban Village have get the service of PDAM Surya Sembada Surabaya but for domestic activities as washing clothes , washing dishes and activities associated by washing still use well water were at every houses. Supported by the water sample a well owned by residents to test laboratory, all of the water has high value hardness the 600 mg/lt and 570 mg/lt. Overall water sample exceeds the maximum allowed namely 500 mg/lt according to PERMENKES no.416/menkes/per/ix/ 1990 about the terms and supervision water quality.

Based on the existing problems , how larger the burden on pollution in Tambak Wedi Urban Village due to use detergents. Then writers interested to conduct research with a title “Pollutant Load of Detergents in Tambak Wedi Urban Village, Kenjeran Subdistrict, Surabaya City in 2014”.

Purpose

To describe large pollutant load of detergents in Tambak Wedi Urban Village, Kenjeran Subdistrict, Surabaya City in 2014.

LITERATURE REVIEW

Detergents is cleaning media synthetic consisting of compounds capable of being extricated dirt, oil and kill bacteria useful and encourage growth algae if there are in sewage in into a body of water (Pankratz, 2001). The application of detergents on the daily life of namely the process of leaching, for example in laundering clothing, laundering household appliances, cleaning on the material, etc. Application of detergents on the daily life of its mechanism estimated same with on industrial because a function of detergents the to remove impurities (Warlina, 2004).

The waste disposal into the river/sources of water without treatment before, containing level pollutants organic high as well as affect conformity the waters of the for human use and stimulates growth algae and other aquatic plants. In addition a detergent in a body of water can damage gills and the organ of respiration fish resulting in tolerance fish to a body of water that the womb oksigennya low being declined. Fish need water that contains oxygen at least 5 mg/quart or 5 ppm (art per million). When levels of oxygen less than 5 ppm , fish will die , but bacteria that the need for oxygen dissolve lower than 5 ppm will grow. When the river of waste burning place containing material organic , most of oxygen dissolved used bacteria aerobic to oxidize carbon and nitrogen in organic matter into carbon dioxide and water. So that levels of oxygen dissolved will decrease rapidly and consequently animals like fish, shrimp and the shells will die (Widiyani, 2010).

According to a Government Regulation No. 82 Year 2001 the pollution is the number of a pollutant contained in water or waste water. According to Djabu (1999) he burden of pollution is a material capacity the polluter multiplied the flow of water containing material the polluter, what this means is the number of heavy pollution in unit time certain, for example kg/day. The term burden pollution associated with the total number of the polluter or a mixture of pollution which to get in the neighborhood had direct or indirectly by an industry or group the industry in a particular area in a given time period. In the case of household wastes and the city, the burden of the term pollution linked to total waste to get in the neighborhood (directly or indirectly from city community during a specified time period).

RESEARCH METHODS

Kind of research

The kind of research this is a descriptive, in a survey that is described how larger the burden on the pollution in coastal areas. With the approach cross sectional, because the data was undertaken based on interviews and observation in the same time/simultaneously. (S. Notoatmodjo, 2010).

Population and Sample

1. Population
   Population in this research is all households in Tambak Wedi Urban Village, Kenjeran Subdistrict Surabaya City having well dig namely 121 households.
2. Sample
   Sample in research is part of number of households in Tambak Wedi Urban Village, Kenjeran Subdistrict to know the use of pollution detergents in the area which use wells in the washing good washing clothes and others are at 55 households.

Data Analysis

Data analyzed by a sort of descriptive set presented in the form of narrations and table for analysis pollutan load uses the method volumetric based on Environmnetal Quality Waste Water for Industries and or Other Business Activities (Pergub Jatim No.72 Tahun 2013).

RESEARCH RESULTS AND DISCUSSION

The Number of Households Use Detergents

The number of the use of detergents usually in Tambak Wedi Urban Village, Kenjeran Subdistrict Surabaya City total of 55 houses is as many as 5.033 gr/day. The use of detergents in Tambak Wedi Urban Village, Kenjeran Subdistrict Surabaya City an average of 91,059 gr/day luminance house while for every 25 gr can wash as many as 5 kg clothing and when the average the use of detergents every house of 91,059 gr/day so can wash as many as 18,301 kg laundry.

Levels of detergents high relative resulting in interference on the cutaneous surface directly or indirectly. Directly any skin disorder are in the form of the heat on the skin at the first contact with detergents where detergents containing NaOH contact with the increases the permeability the skin on old chemical due to the damaged stratum corneum in the skin as a result chemicals is easy to goes to the skin (Mulyaningsih ; 2005 in Afifah 2012). Indirectly is the use of detergents will cause symptoms when the was given in a long time and frequency of often (Sularsito dkk ; 2005 in Afifah ; 2012). So should be used detergents environmentally friendly in detergents where it contains NaOH a little order to reduce effect posed as irritation in the skin at the use of the detergent.

Discharge Emissions Waste Water Laundry

Discharge waste water waste detergents issued by respondents surveyed is as many as 35,000 liters/day and samples to be taken in this research was as many as 55 houses. A discharge of water data issued during the process of leaching used for reckoning the burden of pollution the use of a detergent in the process of leaching. In the calculation of the burden pollution needed the average discharge the water used in any of the home where total discharge whole is divided with samples to be taken so obtained the results of 636,363 liters/day per house.

Pollutant load use of would influence the debits are issued. The bigger discharge captives whom i have caused issued pollution hence the burden of the higher. Burden pollution height could affect the quality of environment when material that flow to the waters through the rivers can make the impact negative with the environment and health. The least found a lot on the site of research is the contamination of river in the area. If concentration excess so bensen content in detergents will bersenyawa with chlorine that is in sea water , form a compound organoklorin that is carcinogen (Linfield, 1976).

Pollutant Load of Detergents in Tambak Wedi Urban Village, Kenjeran Subdistrict, Surabaya City

From scratch that has been done the results debits and pollutant load of detergents in Tambak Wedi Urban Village, Kenjeran Subdistrict, Surabaya City in 2014 namely :

Table I. Discharge And Pollutant Load Of Detergents In Tambak Wedi Urban Village Kenjeran Subdistrict Surabaya City In 2014

Number of laundering during 1 month = 12 times Number of laundering produced 1 month = 219,612 kg cloth.	
DISCHARGE LIQUID WASTE	
Dp (waste discharge measured) = 35 m^3/day DA (the actual liquid waste discharge) = 420 m^3/day DM (maximum liquid waste discharge) = 3,513 m^3/day	
LIQUID WASTE POLLUTION LOAD	
Indicator	**BOD_5 Parameters**
BPM	0,0016 mg/lt
BPA	0,323 mg/lt
BPMi	0,0292 mg/day
BPAi	5,924 mg/day

Keterangan :
BPM : The monthly maximum pollution load
BPA : The burden of the actual pollution monthly
BPMi : Maximum daily load of pollution
BPAi : Pollution loads in fact daily

The pollution actually (BPA) larger than the maximum pollution (BPM). Of the result, it can be said that discharge and load waste pollution detergents contributed pollution of crimes against the environment to parameter BOD_5.

The high burden pollution actually BOD_5 compared with a load maximum pollution , shows that the capacity of the process of/the decipherment of degradation organic materials that is easily decomposes (biodegradable) naturally very limited. This was made possible by waste water use a detergent in the process of leaching necessary processing before entering the environment (a body of water/land). There needs to be supervision of laundering in the event that has characteristics brackish covering control over discharge waste water which dumped and reducing levels of detergents used. hen efforts of control over discharge waste water which dumped and reduction levels detergents used not overcome burden pollution then required products detergents is environmentally friendly accepted by a body of water and land.

Analysis of the impact of the use of detergent pollution load on the environment and health disorders

The result of the pollution load of wastewater indicates that the detergent exceeds the maximum limit load of pollution so that the waste water in washing process wastewater Tambak Wedi Urban Village Kenjeran Subdistrict Surabaya City a major contribution in polluting the land and waters. The two most important ingredients of the shaper and i.e. detergent surfactants builders, has identified the influence of direct and indirect against man and his environment. The research of Heryani and Puji (2008) getting results that nature takes 9 days to spell out 50% of waste detergent.

Other disadvantages of the use of detergent is the occurrence of the processes of eutrophication waters. This occurs because the use of detergents with a high phosphate content. Eutrophication poses for uncontrolled growth water hyacinth and cause the superficiality of the river. In contrast with low phosphate detergents are at risk of causing irritation to the hands and caustic, because of the known more alkalis. Acidic properties (pH) levels between 10-12 (Ahsan S et al, 2005). Based on data obtained by respondents against interviews that most of respunden complained when washing the heat of her skin and contact with detergents. According to the terms of the medical disease associated with the use of detergent is a disease dermatis irritant contact.

Irritant contact dermatitis is an inflammatory reaction of the skin due to an ingredient that is in contact with the skin (Rice et al; 1996 in Afifah; 2012). Irritant contact dermatitis causing ingredients it can be either physical, chemical, or biological (Harahap; 2000 in Afifah; 2012). Direct leaching process gives the consequence will be more frequent contact with ingredients that can cause contact dermatitis. The process of sorting the laundry includes washing, washing, rinsing and soaking. Each work process that allows respondents to contact with agents cause irritant contact dermatitis due to work.

CONCLUSION

1. The Use Of Detergent
   The use of detergent Tambak Wedi Urban Village Kenjeran Subdistrict Surabaya City as much 5,033 gr/day or average as much as 91.059 gr/day/House, for the amount of clothes can be laundered every home is as much 18.301 kg/day.
2. Discharge of waste Detergent
   Discharge wastewater generated in each process of leaching on the Tambak Wedi Urban Village Kenjeran Subdistrict Surabaya City of 35,000 litres/day, the average waste generated 636.363 liters/day/House so as to discharge liquid waste sebernarnya is 420 m3/day (standard that allowed > 3.513 m3/day)..
3. Waste Pollution Load Detergent
   The burden of the actual pollution 0.323 mg/lt/month or 5.924 mg/day (a standard that allowed > 0.0016 mg/lt/month or > 0.0292 mg/day). The actual pollution load values greater than the value of the maximum pollution load so that the burden of waste detergent pollution contributes to high contamination of soils and waters of the lowliest.
4. The Impact Of Waste Detergent
   High pollution load resulted in some of the impact in the environment around them is reducing the quality of the surface water causing the death of fish in the waters, causing the process of eutrophication, the decline in the quality of groundwater, resulting in various diseases such as diarrhea, kasiogenik and the most suffered are skin diseases (irritant contact dermatitis) resulting from direct contact with the detergent.

ACKNOWLEDGEMENT

1. For Local People
   Use of environmentally friendly detergents to reduce the pollution that occurred.
2. For Local Health Agencies
   Should be doing training on detergent wastewater treatment simply by using a biofilter media to reduce the burden of pollution received by the environmental community and raising awareness towards environmental health.

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REMOVAL AMMONIA (NH_3) IN INDUTRIAL CHICKEN SLAUGHTERHOUSE BY ANAEROBIC BIOFILTER

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ABSTRACT
Liquid waste chicken slaughterhouse has the potential to pollute the environment if discharged directly into water bodies without treatment subsequent processing. The high rate of pollution load generated from industrial activities chicken slaughterhouse have caused a decline in environmental quality. Wastewater chicken slaughterhouse containing pollutants such as Biological Oxygen Deman (BOD), Chemical Oxygen Deman (COD), oils and fats, compound ammonia (NH_3) and Total Suspended Solid (TSS) is high. This study will focus on the preliminary NH_3 compound which is one of the pollutant load in wastewater chicken slaughterhouse. NH_3 formed in the anaerobic digestion of protein and long-chain fatty acid formed in the digestion of lipids. The technology used is by applying anaerobic biofilter system. The goal is to know how much efficiency resulting from the processing technology applied. The reactor used consists of 3 types of reactors (R_1, R_2 and R_3) containing media support in the form of bioball and coral as a growing and breeding of microorganisms. Sewage influent concentration used in these observations is 420 mg/L, 400 mg/L and 380 mg/L. From observation it can be concluded that the bioball media effective partner in designated NH_3 and the average allowance was highest in wastewater influent concentration of 380 mg/L, which reached 72%.

Keywords: anaerobic biofilter, sewage influent concentration, NH_3, wastewater chicken slaughterhouse

INTRODUCTIONS

Slaughterhouse wastes are potentially good substrates for biogas production because of high concentrations of proteins and lipids. However, in laboratory reactor studies only relatively low OLRs (0.8–1.7 kg VS/m^3.d) with HRTs of 25–100 d have been noticed to be feasible in anaerobic digestion of slaughterhouse waste (Bayr et al., 2012; Cuetos et al., 2008; Salminen and Rintala, 2002) because high protein and lipid contents of the material causes instability through intermediate products of the digestion process, viz. ammonia nitrogen (NH_4^-N), volatile fatty acids (VFAs) and longchain fatty acids (LCFAs). NH_3 is formed in anaerobic digestion of proteins and long chain fatty acids are formed in digestion of lipids. NH3 nitrogen exists in two forms, NH_3 ions (NH_4^+) and free ammonia nitrogen (NH_3), the latter has been considered to be more inhibitory for the anaerobic digestion process than the former (Koster and Koomen, 1988). The concentration of each form depends on temperature and pH, the higher the temperature the higher the concentration of free NH_3. In a recent study (Karlsson and Ejlertsson, 2012) it was shown that the addition of HCl to decrease pH from 8 to 7.6 and 7.8 improved methane 3 yields of laboratory CSTR reactors treating slaughterhouse waste.

Anaerobic digestion is very efficient and commonly operated for treating organic matters in wastewater (Mata-Alvarez et al., 2000), whereas a few nutrients in waste steams such as nitrogen nutrients (nitrate, nitrite and NH3) and metal ions are rarely ever treated during anaerobic digestion (Chen et al., 2008). Although a portion of nitrogen nutrients is used for the growth and reproduction of microorganisms during anaerobic digestion, the total concentration

of nutrients can be still conserved in anaerobic digestor (Angelidaki and Ahring, 1993; Kim et al., 2015). For the further removal of nitrogen nutrients in organic waste, it is necessary to combine biological or physicochemical processes with anaerobic digesters (Bonmati and Flotats, 2003; Kim et al., 2015; Mata-Alvarez et al., 2000). If these nutrients are subsequently discarded

into water systems without further treatment, the eutrophication of surface water occurs. Among notable nutrients, NH3 is the most predominant species being released as animal or protein rich wastes.

NH3 can be treated and removed by biological reactions. The sequential reaction of nitrification and denitrification is common biological process for treatment and removing of ammonium, in the form of N2 gas (Münch et al., 1996; Obaja et al., 2003). The Anammox process is another biological process for removing NH3, simultaneously converting NH4+/NO2- into N2 gas through the biological reaction of Anammox bacteria (Jetten et al., 2001). These biological processes are already proven technologies and well distributed in wastewater treatment plant. Recently, Kim et al. (2008) proposed NH3 removal by bio-electrochemical reaction using microbial fuel cell (MFC) system. Unlike the aforementioned NH3 removal processes, MFC system is energy positive indicating that electrical energy is produced during the removal of NH3 contained in organic waste. Since Kuntke et al. (2012) reported the possibility of using MFCs for NH3 recovery, bioelectrochemical NH3 removal in MFCs

is of much greater interest to researchers who desire energy-saving environmental energy technologies.

There are two basic mechanisms involved in the NH3 removal in MFCs. One mechanism is the electrochemical path by the migration of NH4+ from the anode to the cathode through a cation exchange membrane (CEM), followed by the conversion of NH4+ ions to NH3 in highly elevated cathodic pH conditions. The NH3 produced in the cathode can then be used for chemical synthesis (i.e., NH3 recovery). Another path for the NH3 removal of MFC is a biological nitrification/denitrification of NH4 to N2 gas (NH3 removal) in a water-based biocathode to which oxygen is mechanically supplied. Hence, to synthesize value-added chemicals such as struvite (MgNH4PO46H2O) and ammonium sulfate ((NH4)2SO4) (Cusick and Logan, 2012; Maurer et al., 2003), the electrochemical path for NH3 gas production is preferred in MFC systems having air breathing cathodes, though not for the biological nitrification/denitrification of NH4 to N2.

The number and characteristics of industrial wastewater in the RPA vary greatly depends on the industrial process and water used for each slaughter activity (Del Nery et al., 2001a). According to Del and Damianovic in Tarntip and Thungkao (2011), chicken slaughter will produce wastewater, especially during the process of cutting and washing of carcasses. The RPA wastewater contains various physical-chemical and microbiological contents, including Bacillus subtilis, Bacillus thuringiensis, and Lysinibacillus fusiform (Tarntip and Thungkao, 2011).

In this case the wastewater from industries chicken slaughterhouse will be processed with anaerobic biofilter system. The initial condition of wastewater for key parameters such as Biological Oxygend Demand (BOD), Chemical Oxygend Demand (COD), Total Suspended Solid (TSS) and NH3 is still above the threshold level liquid waste abattoir (chicken slaughterhouse) established by Regulation Governor of East Java Number 72 Year 2013. Preliminary data wastewater chicken slaughterhouse before processing to BOD of 1,648 mg / L, COD concentration of 2.573 mg / L TSS of 1,130 mg / L and the concentration of NH3 in the amount of 141.28 mg / L, whereas Required by Regulation Governor East Java Number 72 Year 2013 is particularly NH3 levels were 25 mg / L. With loads of great polluters, then it is likely that the chicken slaughterhouse

wastewater will pollute the environment if disposed of directly into the environment. This study was conducted to eliminate NH3 in wastewater chicken slaughterhouse by applying anaerobic biofilter system. If examined from a previous study (Al Kholif, M and J Hermana, 2013) The use of media hydraulic load at 0006m3/m2media.day able to reduce the content of COD is 96.32%. while changes made (Sugito, et al 2016) in the chicken slaughterhouse treat wastewater with initial concentration of the waste of 380 mg / L are capable of removing BOD levels of 98.08%. From these studies it is believed that anaerobic biofilter is also capable of removing NH3 in wastewater chicken slaughterhouse.

MATERIALS AND METHODS

1. Eksperiment set-up

The eksperiment tool is a means of wastewater treatment in general by applying anaerobic biofilter systems are designed in a laboratory scale. Eksperiment reactor made of acrylic with a thickness of 5 mm were filled by the media as a growing and breeding of microorganisms decomposers. The media used is bioball media and coral media in 3 cm diameter. Eksperiment reactor consists of 3 types of various sizes. The first reactor volumes of 0.063 m^3, a second reactor volumes of 0.043 m^3 and a third reactor volumes of 0,028 m^3. **Fig. 1** is a piece of anaerobic biofilter reactor used in the study.

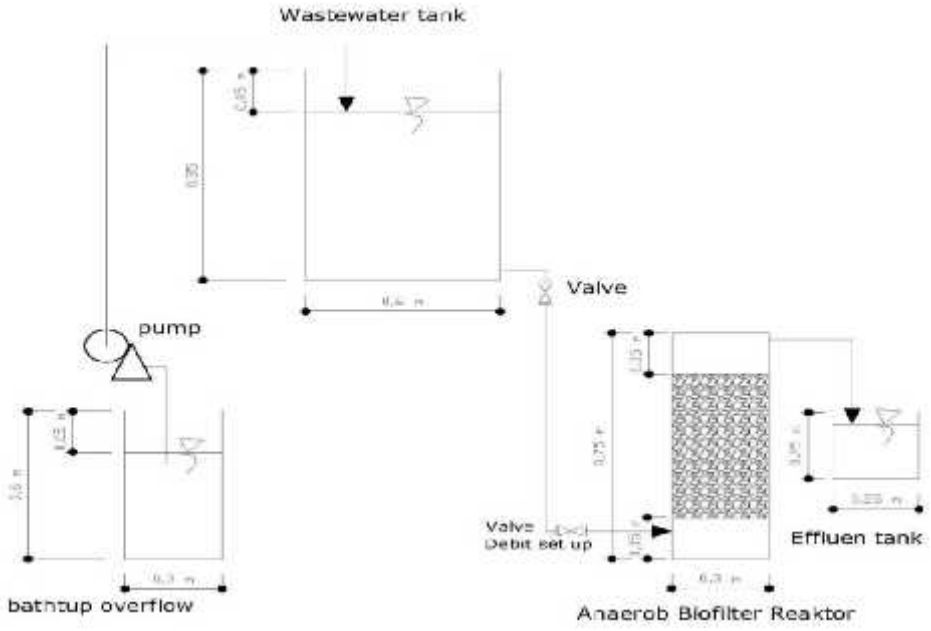

Fig. 1. Anaerobic biofilter reactor a laboratory scale
Sumber : Al Kholif, 2013. *http://digilib.its.ac.id/aplikasi-biofilter-anaerob-pada-air-limbah-cucian-dari-rumah-potong-ayam-rpa-28900.html*

The procedure was performed by pumping chicken slaughterhouse wastewater in the tank overflow towards the tank influent. Then chicken slaughterhouse wastewater flowed into the anaerobic biofilter reactor to do the processing. Debit designs were used in the amount of 50 L / day. In the tub anaerobic biofilter wastewater in the upflow pass buffer media that have been filled in the reactor. Wastewater overflow from the anaerobic biofilter reactor will be accommodated in a container for later analysis.

Chicken slaughterhouse wastewater is used as a sample was obtained from one of the industry chicken slaughterhouse in Sidoarjo. In everyday activity industrial chicken

slaughterhouse as much as 800-1,000 tail cuts of chicken per day. Trial begins by examining the initial parameters to determine the pollutant load to be analyzed. The results of initial tests showed that most of the main parameters exceed the limit established quality standard. Table 1 represents data chicken slaughterhouse wastewater samples before processing in anaerobic biofilter reactor designed in a laboratory scale.

Table 1. Characteristics of early chicken slaughterhouse wastewater

Number	Parameter	unit	Quality standards wastewater *)	Analyses Results
1	pH	-	6-9	7,00
2	TSS	mg/L	100	1.130,00
3	COD	mg/L O_2	200	2.573,00
4	BOD	mg/L O_2	100	1.648,00
5	Oils and fats	mg/L	15	193,00
6	Total NH3	mg/L NH_3-N	25	141,28

The sample used in the eksperiment is a chicken slaughterhouse wastewater after the hair removal process. Chicken slaughterhouse wastewater are taken as samples is the result of the first wash so the content is still so much blood.

2. Analyses and calculations

The eksperiment data obtained will be analyzed graphically and explained to know how big the removal efficiency of NH_3 in chicken slaughterhouse wastewater of each media. The graphical method used as reference in view of the decrease in the observed parameters. The first step in the analysis of NH_3 is to know in advance the value of the calibration NH_3 that will serve as the basis for calculating the analysis of NH_3 present in the chicken slaughterhouse wastewater.

Value be obtained from the results of NH3 is the value read on spectophotometric with a wavelength of 410 µ. The values are then entered into the NH3 calibration values that have been obtained previously. Attaining a linear value (R2) that is equal to 0.991 (Fig. 2) indicates that the calibration of the NH3 already meets the analysis procedure so that the value obtained from spectrophotometry can be analyzed using the equation is y = 0,3742x + 0.0384 where the value (x) is the value obtained from measurements at spectrophotometry. Fig. 2 is a calibration graph NH3.

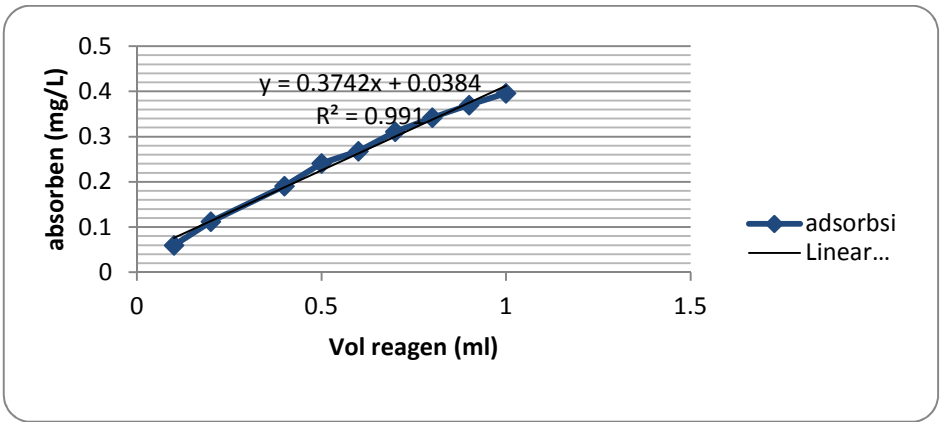

Fig. 2. Graphically NH_3 calibration

RESULTS AND DISCUSSION

1. NH_3 levels in chicken slaughterhouse wastewater

The existence of NH_3 can cause conditions toxic to aquatic life. Free NH_3 levels in water increases with increasing pH and temperature. Aquatic life is affected by NH_3 at a concentration of 1 mg/L and can cause death because it can reduce the concentration of oxygen in the water (Widayat et al, 2010). The content of the high NH_3 and low organic matter are the main characteristics of the anaerobic chicken slaughterhouse waste. Chicken slaughterhouse waste containing NH_3 is high with low organic matter can processed by implementing technology systems sequencing batch reactor (SBR) (Shengquan et al, 2008; Keller et al, 1997; Pochana, et al, 1999; Subramaniam, et al, 1994). A low concentration of organic matter, dissolved oxygen enough and time detention of sludge which allows nitrification and denitrification are in stable condition (De Nardi, et al, 2011).

2. NH_3 removal efficiency

The main types of waste produced by slaughterhouse industry generally consists of blood, feathers, offal (remnants of the intestine and cloaca pieces), bones and dead chickens. From the measurement results it is figured that the waste in the form of blood is approximately 3.5%, 5% intestinal waste, and dead chickens of 0.5% out of the number of slaughtered chickens per day (Voslarova *et al.*, 2007; Bolu and Adakeja, 2008).

2.1 NH_3 Removal Efficiency

The data displayed is the data from the results of calculations using the equations derived from NH_3 calibration figures. The initial concentration of the waste used in this study is 420 mg/L, 400 mg/L and 380 mg/L. At the effluent concentration of 420 mg/L, an average removal reached 63% of the reactor volume of 0.063 m^3 (R_1), 59% of the reactor volume of 0.043 m^3 (R_2) and 61% in volume of 0,028 m3 reactor (R_3). While on coral media remove efficiency reached 62% in R_1, R_2 and 61% at 60% at R_3. The complete presented in **Fig 3** below.

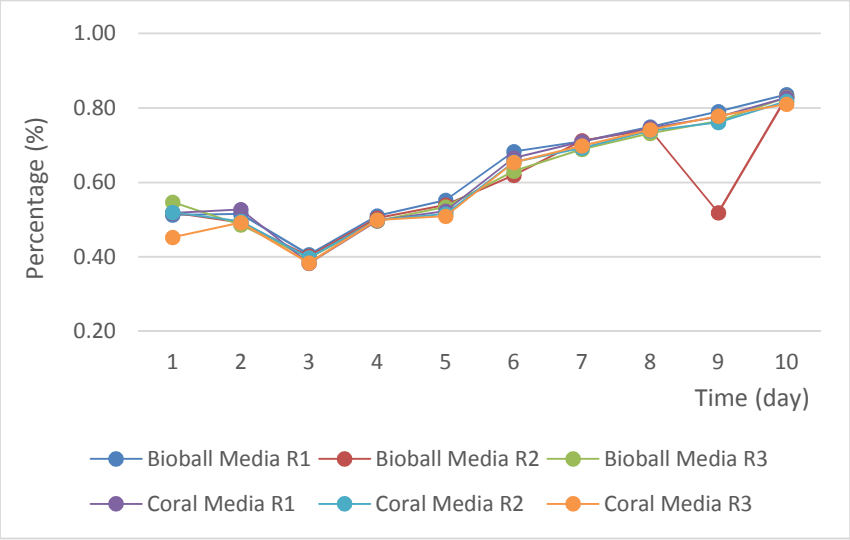

Fig 3. NH_3 Removal Efficiency at concentration of 420 mg/L

Increased NH_3 removal efficiency can also be influenced by acidity condition (pH) in the reactor. During the observation, the average value of pH in wastewater treatment

reactors reached 7.2. While the average temperature where the temperature reaches 31°C. Meanwhile, according to Rhenny Ratnawati, *at al* (2016), the use of anaerobic-anoxic-oxic with a temperature range between 29-34°C and pH figure of 8.7 reduces the concentration of organic solid waste in cow dung. On the other hand, the anaerobic digestion of slaughterhouse waste with manure and industrial products proved his worth with the NH_4-N concentration of more than 6 g/L (Karlsson and Ejlertsson, 2012).

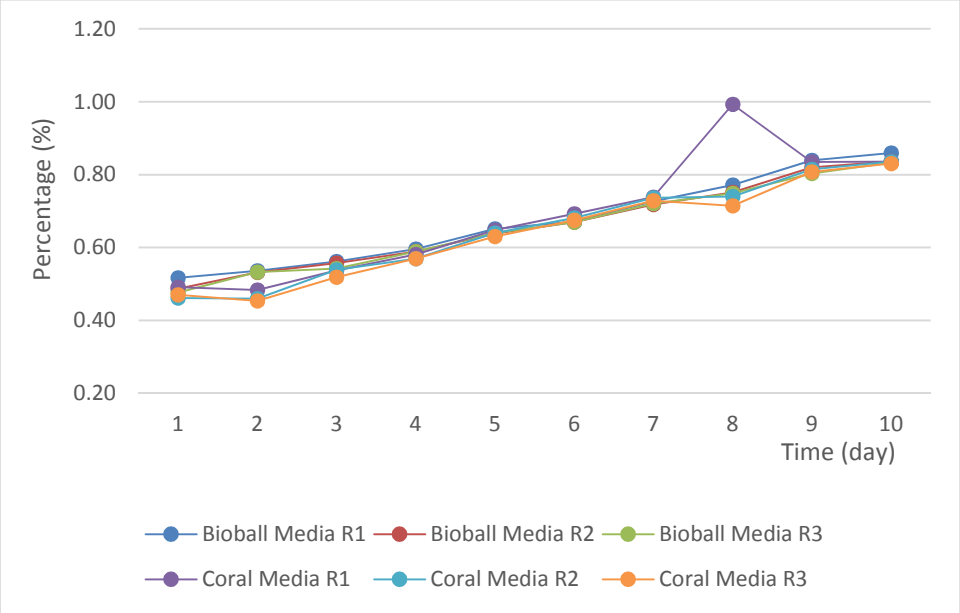

Fig 4. NH_3 Removal Efficiency at concentration of 400 mg/L

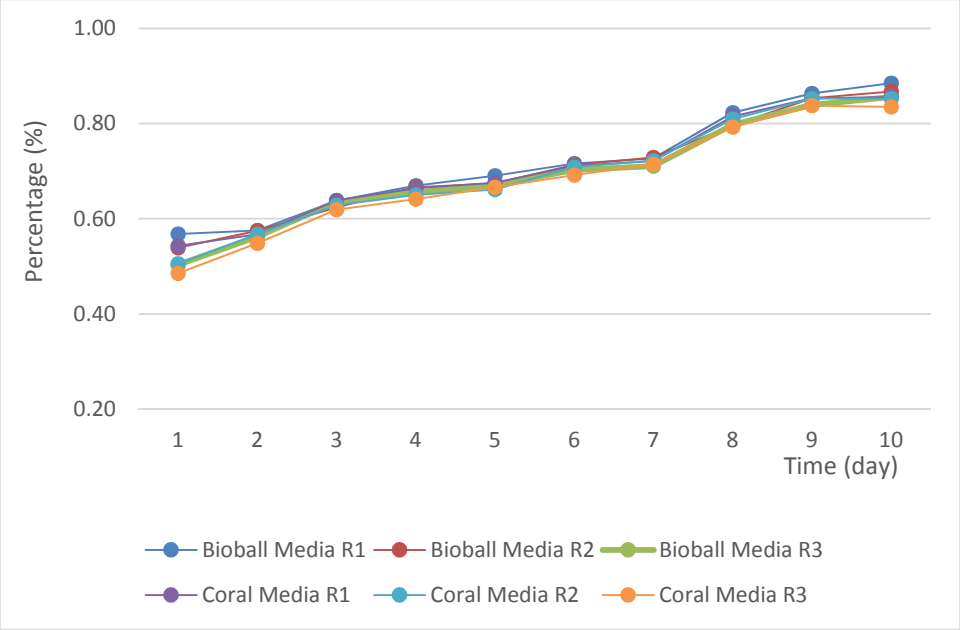

Fig 5. NH_3 Removal Efficiency at concentration of 380 mg/L

At concentrations of liquid waste 400 mg/L and the concentration of liquid waste 380 mg/L also increased the removal efficiency of ammonia compounds (Fig 4 and 5). Since the first day of the preliminary observations of NH_3 compounds are already more

than 50%. At concentrations of wastewater 400 mg/L (Fig 4) has increased dramatically on days 8 that peak at 99% that occurred in the reactor R1 then decreased, but not drastically. Overall the average allowance largest coral occurs in media with an average allowance at R_1 reactor reaches 68%, the R_2 reactor reached 65% and the R_3 reactor reached 64%. The compound is a gaseous NH_3 is usually contained in wastewater chicken slaughterhouse. This study uses microorganisms which form biofilms as degrading contaminants. The rate of degradation of contaminants can be modeled by microscopic based model of biofilm developed Mohseni and Allen (2000). The model was based on the assumption that: following the reaction kinetics Monod; biofilter following the operation in plug flow without axial direction velocity dispersion, biofilm growth is homogeneous, and the availability of nutrients in addition to contaminant compounds excess cells so that the limiting factor is the contaminant compounds.

The use of natural media such as palm fibers is considered effective in eliminating H_2S and NH_3. Performance aside biofilter in H_2S and NH_3 is fairly good. By using natural campfire media capable of removing more than 99% with a maximum contaminant allowance rate (Vmax) The highest 119 $g/m^3.h$ for H_2S and NH_3 gas of 76 $g/m^3.h$ (Suwardin D. et al, 2007). The average allowance for NH_3 at concentrations of effluent 380 (fig 5) look better. The average allowance of 70% NH_3 lebiha. Allowance is highest in the reactor R_1 with an average allowance reached 72%. If viewed from the first day of observation until days 10 of observation, where every day continues to experience the progressive increase in the designated compound NH_3. Allowance was highest on day 10 of observation, which reached more than 85% and most highest allowance is happening on R_1 bioball media is by 89%. Opt-out mechanisms in the biofilter is controlled by the limitations of the removal rate biochemistry of cells to degrade contaminants both H_2S and NH_3. Did not happen significant obstacles as a result of the diffusion process H_2S and NH_3 in the biofilm (Suwardin D. et al, 2007). Chicken slaughterhouse sewage treatment by applying anaerobic biofilter technology is very effective at weeding out contaminants in the waste chicken slaughterhouse khsusnya NH_3 compound.

CONCLUTIONS

Anaerobic biofilter technology is suitable in processing of waste classified as waste with great concentration. This is evidenced by the high value of efficiency resulting in wastewater chicken slaughterhouse. In the process of the preliminary observations of the largest NH_3 compound which reached 99% in corals media with concentrations of liquid waste 400 mg/L. But if the review of the effectiveness of the media in the designated compound NH_3, then the bioball media effective partner in the designated compound NH_3 with an average allowance reached 85%. Neither bioball media or coral media, it turns out better designated R_1 reactor NH_3 compound with an average high of 72% allowance.

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Ig M AND Ig G TOXOPLASMA POSITIVE AND ITS CORRELATION TO PERSONAL HYGIENE OF SLAUGHTERED HOUSE' EMPLOYEES IN SURABAYA CITY

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ABSTRACT
Toxoplasmosis is a disease that transmitted from animal to human (zoonosis). The employees at slaughter house contact directly to animal that can be a risk of zoonosis transmission. This research aimed to analyze the correlation of toxoplasmosis incidence and employee personal hygiene that contact directly to animal at slaughter house. The research was observational analytic with cross sectional approach. Population in this research was all employees at slaughter house Pegirian, Semampir, Surabaya that not only contacts directly to animal but also don't have any pet at home and willing to be a respondent. The sample was 15 respondents which were total sampling. Variable of toxoplasmosis obtained from examination of IgG and IgM toxoplasmosis, while variable of personal hygiene consist of hand, nail hygiene, and personal protective equipment. The incidence of toxoplasmosis in slaughter house employee that contact to animal is 60%. There was a correlation between personal hygiene consist of hand, nail hygiene, and personal hygiene with incidence of toxoplasmosis in slaughter house employees that contact to animal (*fisher's exact* $p<0,05$). The using of personal protective equipment was in category less. It is concluded that there was a correlation between personal hygiene with incidence of toxoplasmosis in slaughter house employees that contact to animal. It is suggested to use personal protective equipment that is suitable such as gloves and mask. The using of special clothing during working and immediately replace it with another when working finished, and slaughter house Surabaya City should be examine the employee's health especially that contact directly to animal regularly every 6 months.

Keywords : incidence of toxoplasmosis, personal hygiene, slaughter house

INTRODUCTION

One infectious disease that is still endemic and close to the community is toxoplasmosis. Toxoplasmosis is a disease of animals that can be transmitted to humans are called zoonotic diseases also. This happens because of human life can not be separated from animals. Distribution of *Toxoplasma gondii* are widespread throughout the world (cosmopolitan), while prevalence (incidence rate) various of depending on the climate, geography, and a cat in an area. Cats and his family (Felidae) serves as definitive host, while other warm-blooded animals, including humans as an intermediary host (WHO, 1979).

Prevalence of *Toxoplasma gondii* in cattle in Indonesia are in the range 24-61% goat, 28% pig, 43% sheep, 36% cow, 27% buffalo, 20% chicken, and 6% duck. In 10-40% of pet cats, 10% dog, and 14-82% in human (Iskandar, 1999). According to research by Gandahusada (1995), prevalence of *Toxoplasma gondii* antibodies are 35-73% cat, 11-36% pig, 11-61% goat, 75% dog and the other cattle less than 10%.

Prevalence of toxoplasmosis in sheep, goats, cows, and pigs in Yogyakarta are 50%, 18%, 2% and 44%. Prevalence of toxoplasmosis in slaughtered house Surakarta are reported in 23% sheep, 21% goat, 1% cow and 25% pork, whereas in slaughter houses's employee which handle sheep/goats is 64%, 55% beef, and 32% pork (Hartati and Wieklati, 1992). 30% of healthy dogs and cats estimated have T. gondii antibodies (Nelson and Couto, 2003). Serological prevalence of toxoplasmosis in cats in Jakarta reached 72.7% (Gandahusada,

2000). Hartati (1993) states that prevalence of toxoplasmosis in cat in Yogyakarta is 40%. Prevalence of toxoplasmosis both on animals and humans are very various with proportion of population infected with T. gondii in humans, especially depending on geographical location and lifestyle. While in slaughtered house in Pegirian Surabaya, 37 of blood serum in cow derived from Ongole and Madura, there are 25 individuals (64.86%) positive toxoplasmosis by using dot blot test (Wiradirga, 2010).

Toxoplasma gondii's infection are subclinical, but also cause severe symptoms and even fatal, especially in patients with immune deficiencies, and congenital infection that cause mortality rate is quite high, whereas in pregnant women can cause miscarriage. Children with congenital toxoplasmosis may show clinical syndromes, such as cerebral calcifications, chorioretinitis, hydrocephalus, microcephaly, psychomotor disturbances, convulsions, blindness, mikrooftalmia and bilateral katarakta (Handojo, 2004).

Toxoplasmosis is generally asymptomatic, only a few are actually showing symptoms of illness and usually undiagnosed (Garcia and Bruckner, 1996). Diagnosis of toxoplasmosis can be made by finding IgM and IgG antibodies of patient's blood serum (Handojo, 2004). The fisrt antibodies is IgM and then IgG. IgM can be decrease while IgG will settle in long term even a lifetime (Bellanti, 1993).

Incidence of toxoplasmosis in Indonesia worsened by environmental sanitation and number of sources of transmission. Toxoplasmosis need attention because there are variety of clinical manifestations in humans, especially in immunocompromised individuals. Toxoplasmosis cause behavioral changes in host and increase level of dopamine in brain that might cause schizophrenia in humans (Flegr *et al.*, 2003).

Research of Fitri (2012) suggests there is a correlation between incidence of toxoplasmosis with personal hygiene at the Animal Clinic of Department of Animal Husbandry East Java with value of p=0.030 with incidence of toxoplasmosis in employees are 66.7%. While personal hygiene consist of hand, nail hygiene, and personal protective equipment (PPE) at the Animal Clinic of Department of Animal Husbandry East Java is 50.0% in category less.

Slaughter houses's employees contacts directly to animal can be risk transmission of zoonotic diseases. Frequent contact with contaminated animals or meat, can be correlate with higher prevalence among veterinarians, veterinary students, slaughter houses's employees and people who are handling of raw meat such as a cook (Light, 2003).

Preventive action to reduce risk transmission of diseases well known or not is personal hygiene. Hand and nail hygiene are basic components that are often used and most effective method to prevent transmission of disease via oral. In addition, use of personal protective equipment also required for possibility of further contacts to source of disease (WHO, 2007).

Slaughter house's employee is one of risk factors of *Toxoplasma gondii* infection, especially employees who are contacts direct to animal. Likewise, less of personal hygiene can increase risk transmission of disease. Early examination required to determine incidence of toxoplasmosis disease and its prevention.

METHOD

The research was observational analytic with cross sectional approach. Research was did in slaughter house Pegirian, Semampir, Surabaya. Population in this research was all employees at slaughter house Pegirian, Semampir, Surabaya that not only contacts directly to animal but also don't have any pet at home and willing to be a respondent. Employee whose contact directly to animal is 7 keurmaster, 6 interpreters and 20 assistants interpreter. The total sample in this research was 15 respondents.

Examination of Toxoplasma IgM and IgG obtained by taking blood in median cubital vein and then analyzed by ELFA method. Toxoplasma IgM and IgG examination conducted at the Balai Besar Laboratorium Kesehatan Surabaya City (BBLK). While personal hygiene (hand, nail hygiene, and personal protective equipment) employees whose contact directly to animal in slaughter house obtained by using questionnaires and observation with observation sheet guide. Data analysis to determine correlation of toxoplasmosis incidence and employee personal hygiene that contacted directly to animal at slaughter house used Fisher's exact test. p value<0.05 was considered as significant results.

RESULT

Incident of Toxoplasma can be identified from employees who are or who were infected with protozoan *Toxoplasma gondii*. It can be seen from results of serological tests Toxoplasma IgM and IgG antibodies reactive (positive). Slaughtered house' employees contacted directly to animal which had IgM antibody (-) and IgG (-) toxoplasma as many as six people (40%) and 9 others (60%) had IgM antibody (-) and IgG (+) toxoplasma. That was means incidence of toxoplasmosis in slaughterhouse employees that contact to animals was 60%.

In this research, Personal hygiene such as hand, nail hygiene and used of personal protective equipment was an attempt to prevent the transmission of toxoplasmosis. Correlation of toxoplasmosis incidence and employee personal hygiene that contacted directly to animal at slaughter house can be seen in table below.

Table 1 Correlation of toxoplasmosis incidence and employee personal hygiene that contacted directly to animal at slaughter house

Personal Hygiene	**Incident of Toxoplasmosis**				**Total**	
	Negative		Positive			
	N	%	n	%	N	%
Good	5	100.0	0	0.0	5	100.0
Less	1	10.0	9	90.0	10	100.0
Total	**6**	**40.0**	**9**	**60.0**	**15**	**100.0**
p = 0.002						

Slaughtered house' employees that contacted directly to animal with personal hygiene in category good, all 5 people (100%) negative toxoplasmosis. While slaughtered house' employees that contacted directly to animal with personal hygiene in category less, 1 person (10%) negative toxoplasmosis and 9 (90%) positive toxoplasmosis. Results of statistical analysis used Fisher's exact test p value <α (p=0.002 and α=0.05). That means there was correlation of toxoplasmosis incidence and employee personal hygiene that contacted directly to animal at slaughter house.

DISCUSSION

Slaughtered house' employees Semampir Surabaya that contacted directly to animal, had 100% IgM antibody negative (non-reactive) toxoplasma, while 60% IgG antibody positive (reactive). This suggested that slaughtered house' employees that contacted directly to animal had been infected by protozoan *Toxoplasma gondii*. Thus, incidence of toxoplasmosis in slaughtered house' employees that contacted to animal was 60%.

Researched of Fitri, 2012 showed incidence of toxoplasmosis in employees at the Animal Clinic of Department of Animal Husbandry East Java was 66.7% (IgM and IgG Toxoplasma positive (reactive) was 8.3% and IgM negative (non-reactive) and IgG (reactive) was 58,3%). Anti Toxoplasma IgM examination conducted to determine

existenced of IgM antibody to *Toxoplasma gondii* parasite. IgM antibody began production in the first week after infection, reached a peak after 1-2 months, and decreased again after four months, but about 50% of patients infected with this parasite, IgM can still be traced to one year post-infective primary (Handojo , 2004).

Examination of Anti-Toxoplasma IgG was did to determine existenced of IgG antibody to *Toxoplasma gondii* prasite. Anti Toxoplasma IgG occured several weeks after the IgM, peaked after 6 months and persisted at high titers for several years, and then decline slowly, and settled at lower levels of lifetime (Handojo, 2004). IgM rapidly decreased while the IgG will settle in the long term even a lifetime (Bellanti, 1993).

Most people with igG positive Toxoplasma-specific, didn't show clinical symptoms. Instead acute toxoplasmosis (active) was usually found in people with immunosuppression include malignant tumor patients were given drugs sitostatika, people with AIDS or organ transplant patients who would thus be given medications to suppress immune system (Handojo, 2004).

Employees who were contacted directly to animal had risk of protozoan *Toxoplasma gondii* infection due to frequent contacted with animals that chance of these protozoa (Light, 2003). Moreover, the transmission can be through by the air with suction of point saliva of patients with pneumonitis toxoplasmosis and usually are sick animals. Also contacted between skin and tissue or diseased animal excreta for example, a cat can caused infections in humans (Soedarto, 1992).

After infected of *Toxoplasma gondii* in the body will be a process that consists of three phase, namely parasitaemia, where the parasite attacked organs and tissues and multiply with destroyed host cell. The most obvious self propagation occured in reticuloendothelial tissue and brain, where the parasite had the greatest affinity. Formation of antibodies was the second phase after infection. The third phase was chronic phase, formed cysts that spreaded in the muscle tissue and nerves, which were settled without causing local inflammation.

In patients with immunodeficiency, *Toxoplasma gondii* infections become apparented, for example in patients with carcinoma, leukemia or other diseases that were given high-dose corticosteroid treatment or radiation. The usually symptoms were high fever, accompanied by symptoms of central nervous system because of diffuse encephalitis. Severe clinical symptoms may be caused by acute exacerbation of infections that occured before or as a result of new infections as clinical symptoms for immunodeficiency.

In AIDS patients, *Toxoplasma gondii* infection often causes encephalitis and death. Most AIDS patients with encephalitis due to *Toxoplasma gondii* didn't showed formation of antibody in serum (Cornain *et al*., 1990). Treatment of toxoplasmosis can be done with therapy antiparasitic drugs in combination Pyrimethamine with Sulfadiasin. Toxoplasmosis in pregnant women can be treated with spiramycin. Newborns with antibodies toxoplasmosis should be given preventive treatment until IgM antibody were not found (Garcia and Bruckner, 1996).

One of the precautions action to prevent diseases including toxoplasmosis was to maintain personal hygiene. Personal hygiene was a personal business or yourself to maintain or to improve health. Employees at the veterinary clinic, especially veterinarians and officials enclosure had risk of toxoplasmosis due to frequent contacedt with pets such as dogs and cats that are likely suffering from protozoan *Toxoplasma gondii* (WHO, 2006).

In this researched, there was a correlation between personal hygiene consist of hand, nail hygiene, and personal hygiene with incidence of toxoplasmosis in slaughter house employees that contact to animal in Semampir Surabaya (*fisher's exact* $p<0,05$). The using of personal protective equipment in this researched can't be analyzed statistically because

all of were in less category. Personal hygiene includessuch as hand, nail hygiene, and using of personal protective equipment in slaughtered house' employees in Semampir Surabaya that contacted directly to animal was 66.7% in less category.

Hand washed with proper practiced was healthy behavior that have been scientifically proven to prevent spread of infectious diseases and transmitted diseases (Depkes RI, 2009). Preferably after checked condition of animal, cutting animal, skinning and/or after cleaning slaughtered house were required to immediately washed your hands. Hand washed must be done properly and correctly. Hand washed done using running water, soap and dried with a dried towel disposable was provided at one place to facilitate employees. Hand washed facilities also be provided at any place or room where the possibility of medical and non medical personnel that contact or contact directly to a pet suspected of toxoplasmosis.

Maintain cleanliness of nails was series activities to prevent spread of infectious diseases along with hand washing. Cleaning nails diligently while dirty and/or length.

Using of personal protective equipment was as standard precautions to reduce risk transmission of infection transmission of pathogens from animals to humans (WHO, 2007). Personal protective equipment that used were gloves, masks that consists of eye protection and mouth, and a special working clothes. Using of personal protective equipment by slaughtered house' employees that contacted to animals was intended to minimize potential hazards of job that can caused effected on health, especially transmitted diseases from animals to humans (zoonoses). Employees should kept hand cleaned after using personal protective equipment because of possibility of accidental hand would touch a part of personal protective equipment which may be contaminated by parasitic infectious diseases.

Researched of Fitri 2012 also mentioned that there was a correlation of toxoplasmosis incidence and employee personal hygiene at the Animal Clinic of Department of Animal Husbandry East Java (Fisher's exact test, $p<0.05$). The researched stated that personal hygiene suvh as hand, nail hygiene and using of personal protective equipment of at the Animal Clinic of Department of Animal Husbandry East Java was 50.0% in less condition.

Respondents with high Toxoplasma IgG titer reflected that personal hygiene of employees was on less condition. Incidence of toxoplasmosis was influenced by various factors. In addition personal hygiene, incidence of toxoplasmosis also influenced by level of knowledge and environmental sanitation that could lead higher transmission.

CONCLUSION

There is correlation of toxoplasmosis incidence and employee personal hygiene that contacted directly to animal at slaughter house Semampir Surabaya. Statistical test results using Fisher's Exact Test obtaine value of $p=0.002$. Incidence of toxoplasmosis in slaughter house's employees Semampir Surabaya whose contact with animals is 60%. No one of employee has Toxoplasma IgM positive, but employees who have Toxoplasma IgG positive are 60%. Personal hygiene consist of hand, nail hygiene, and using of personal protective equipment on slaughter house's employees Semampir Surabaya that contact to animal is 66.7% in category less.

Slaughter house's employees should use personal protective equipment that is suitable such as gloves and mask when working/contact with animals, using of special clothing during working and immediately replace it with another when working finished. While slaughter house Surabaya City should be examine the employee's health especially that contact directly to animal regularly every 6 months.

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CLIMATE CHANGE AND INFECTIOUS DISEASE IN INDONESIA

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ABSTRACT
In Indonesia, the annual average temperature has increased 0.3˚C. Precipitation pattern has changed; there has been a decrease of annual rainfall in the southern area and an increase in the northern area. Majority of infectious disease related to climate change is vector-borne disease and water-borne disease This research is literature review. Data collected from scholar google with key words "iklim + penyakit". Article published in the last 10 years, since 2006. There are 27 climate and dengue articles, 6 climate and diarrhea articles, 6 climate and malaria articles. The result showed that mostly malaria has influenced by rainfall and humidity. Dengue hemorrhagic fever is almost influenced by all climatic factors. Diarrhea is sometimes influenced by climatic factors. All of these result showed the climate and disease trends, because data source was secondary data. It all depends on the completed continuous data in several years. For minimum is five years. However, the disease is occurred is multifactorial, so it may the other factor is more dominant.

Keywords: climate change, infectious disease, vector-borne disease, water-borne disease

INTRODUCTION

In Indonesia, the annual average temperature has increased 0.3˚C. Precipitation pattern has changed; there has been a decrease of annual rainfall in the southern area (e.g., Java, Lampung, South Sumatra, South Sulawesi, and Nusa Tenggara) and an increase in the northern area. (e.g., most of Kalimantan, North Sulawesi) (Boer and Faqih, 2004). There has also been a shift in the seasonality of precipitation (wet and dry seasons); in the southern area the wet season rainfall has increased while the dry season rainfall has decreased, whereas the opposite pattern was observed in the northern area (Boer and Faqih, 2004). Overall annual precipitation has decreased by 2 to 3% in Indonesia.

Climate change has affected to human health that divided into direct and indirect. The direct effect is due to an increase temperature, a change temperature, and an increase of sea level that result in heat waves, flood, storm, and drought. The extreme condition can lead into injury, illness, and death. Indirect effect is like an increase infectious diseases and poor nutrition. Majority of infectious disease related to climate change is vector-borne disease and water-borne disease. Vector-borne disease in Indonesia mostly is dengue fever and malaria. Meanwhile, the most water-borne disease in Indonesia is diarrhea. Another infectious disease is due to migration, an increase of respiratory disease from low air quality and burning, and also endemic disease (Checkley et al., 2000).

Vector-borne disease is re-emerging disease that the case is 1 of 6 from total diseases in the world. It is estimated more than half population in the world is being risky to vector-borne disease. Vector-borne disease is caused by pathogenic microorganisms that can result in death as many as 1 million people in the world (WHO, 2014). Vector-borne disease in Indonesia is neglected tropical disease. Related factor of endemic disease in Indonesia is

tropical climate, unhealthy environment, social economy, and bad sanitation (Heath Ministry, 2015). In the latest decade, there is an increase of vector-borne disease in the world. One of factor is environmental change. In 2012, dengue fever is the leading of mosquito-borne disease. The increase of dengue fever is as much as 30 times in 50 years (WHO, 2014).

Water-borne diseases are caused by pathogenic microorganisms that can be directly spread through contaminated water. Most water-borne diseases cause diarrheal illness. Eighty-eight percent of diarrhea cases worldwide are linked to unsafe water, inadequate sanitation or insufficient hygiene. These cases result in 1.5 million deaths each year, mostly in young children. The usual cause of death is dehydration. Most cases of diarrheal illness and death occur in developing countries because of unsafe water, poor sanitation, and insufficient hygiene (CDC, 2012).

Many factor contributed to infectious disease. Blum (1974) stated that environment is one of predisposing factor in occurring disease. Several studies have discussed about climate change and its effect to human health. The objective of this study is to identify climate change and infectious disease in Indonesia (vector-borne disease and water-borne disease).

METHODS

Data is obtained from scholar google with key words “iklim” + “penyakit” for dengue fever “iklim” + “dengue”, for malaria “iklim” + “malaria”, for diarrhea “iklim” + ”diarrhea”. Article published in the last 10 years, since 2006. There are 27 climate and dengue articles, 6 clmate and diarrhea articles, 6 climate and malaria articles.

RESULT AND DISCUSSION

Climatic factors are temperature, humidity, rainfall, rainy days. Research by Suwito (2010), the result showed that temperature above 27°C anopheles density decreased. Pearson correlation $\alpha=0.05$, p value $=0.757$ ($p>0.05$) means there was no correlation of temperature and anopheles density per human per night (MBR). Pearson correlation $\alpha=0.05$, p value $=0.026$ ($p<0.05$) means there was a correlation of humidity and anopheles density per human per night (MBR). Pearson correlation $\alpha=0.05$, p value $=0.005$ ($p<0.05$), means there is a correlation of rainfall and anopheles density per human per night (MBR). There was no correlation of anopheles density and malaria disease (pearson correlation p value =0.901). But, there is a correlation of anopheles density and malaria cases in month later (pearson correlation p value=0.021 ($p<0.05$).

Literature study by Duarsa (2008) mentioned that hot and humid air is suitable for anopheles. In the past, anopheles is more frequent in transient between 2 seasons (rainy season and dry season). But now the time span lasts almost throughout a year. Both hot, humid air and poor sanitation as well commonly provide a pool of water to breed. The temperature has affected the length of time sporogony cycle or intrinsic incubation. The higher of temperature (at certain extent) is the shorter intrinsic incubation time, vice versa. Commonly, rainy time will ease the mosquito development and has occurred malaria epidemic. The effect depends on rain type, heavy rain, long raining day, vector type, and breeding place.

WHO in Susanna (2005), many places malaria incidence correlate to rainy season, but the correlation is unclear or sometimes anomaly. Raining will ease the breeding of mosquito if it is not too heavy. If heavy raining, it will kill mosquito larvae easily. On other places, in dry season will be occur malaria epidemic. It is estimated by 2100 that average global

temperatures will have risen by 1.0–3.5°C, increasing many vector-borne diseases in new areas. For many diseases these lie in the range14–18 °C at the lower end and about 35–40°C at the upper end. Malaria and dengue fever are among the most important vector-borne diseases in the tropics and subtropics (Githeco, 2000).

Research by Sintorini (2007) was to make system dynamic model using ecological analysis to identify the dynamic of dengue hemorrhagic fever cases related to the climate variability in Jakarta city. The result showed that dengue hemorrhagic fever cases are influenced by rainfall, temperature, outdoor humidity, indoor humidity, AHJ, NIR, and knowledge ($p<0.05$). The most influencial climatic factor to dengue hemorrhagic fever cases are rainfall, humidity, temperature, and knowledge. System dynamic showed that 4 subsystem which are climate subsystem, aedes subsystem, human subsystem, and dengue hemorrhagic fever subsystem. The mosquito activity (AHJ) is media between vector subsystem and dengue hemorrhagic fever subsystem. An increase of rainfall will increase AHJ, so dengue hemorrhagic fever cases will increase. The rainfall indirectly influenced to AHJ, which means the direct influence is temperature and humidity.

The research conducted by Ariati and Anwar (2014) showed that predictor factor of dengue hemorrhagic fever has been influenced by 4 climatic factor which are rainfall, rainy days, temperature, and humidity 2 month before and 1 month prior dengue hemorrhagic fever incidence. According to Sukowati in Ariati and Anwar (2014) that rainfall index is not directly influenced mosquito development but ideal rainfall is. Meanwhile, Mangguang research (2013) showed that there was no climatic factors are related to dengue hemorrhagic fever in Padang year 2008 -2010.

The most influencial climatic factors for vector-borne disease include not only temperature, rainfall, but also sea level elevation, wind, and daylight duration. The most influencial climatic factors for water-borne disease are rainfall that can influence the transport and dissemination of infectious agents while temperature can affect their growth and survival (WHO, 2003).

Research by Yoerdy (2015) was to identify relation of climate and diarrhea incidence in two areas in West Sumatera year 2010 – 2014. The result showed that there were no correlation of climatic factor and diarrhea incidence in both areas ($p>0.05$). Meanwhile, research by Nahari (2016) showed that there is a correlation of rainfall and diarrhea with positive correlation in Bandarharjo Public Healthcare, Semarang ($p=0.0001$; $r = 0.664$), there is a correlation of temperature and diarrhea with negative correlation in Bandarharjo Public Healthcare, Semarang ($p=0.018$; $r = - 0304$), there is a correlation of humidity and diarrhea in Bandarharjo Public Healthcare, Semarang ($p=0.0001$; $r = 0.554$).

There is strong evidence that diarrhea with etiology is bacteria and protozoan pathogen is sensitive to variants of temperature and rainfall over daily, seasonal, and inter annual time periods. Existing evidence the link between climate and pathogen specific diarrhea is can not be used to due to the information of certain pathogenic microorganism is unavailable. The changing of rainfall pattern is also can not be used to because of the difference region (WHO, 2003).

CONCLUSION

The result above showed that mostly malaria has influenced by rainfall and humidity. Dengue hemorrhagic fever is almost influenced by all climatic factors. Diarrhea is sometimes

influenced by climatic factors. All of these result showed the climate and disease trends. Data source was secondary data. It all depends on the completed continuous data in several years. For minimum is five years. However, the disease is occurred is multifactorial, so it may the other factor is more dominant.

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BEHAVIOR AND MOBILITY OF COMMUNITY WITH DENGUE HEMORRHAGIC FEVER (DHF) IN SURABAYA

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ABSTRACT
The incidence of Dengue Hemorrhagic Fever (DHF) is a 1504 incident with a CFR of 0.4% (6) (East Java Provincial Health Office, 2013). Cases of dengue fever in Surabaya is constantly increasing. And the end of February 2014 stated Surabaya Extraordinary Events Dengue local. This study aims to determine the relationship habits of mosquito nest eradication (PSN) and the incidence of dengue fever in Surabaya. This study used case control design with a sample size of 300 people consisting of 150 cases and 150 controls. Cases are individuals who suffer from dengue fever which had been treated in hospital and reported to the Health Department of Surabaya on March 1, 2013 to May 15, 2014, while the case controls selected from the neighbors who live within 100 meters from the residence cases. This study analyzes the relationship habit of doing PSN with Dengue Hemorrhagic events, people who are not doing PSN 4.89 times the risk of DHF compared with individuals who did PSN after the variable neighbor history ever dengue illness, the presence of objects that can be a container of water around the house and mobility of non-endemic areas kedaerah endemic. Suggestions that there is addition of mosquito nest eradication (PSN) socialization needs to be done larviciding and 3 M of housing and residential environment, particularly areas that never existed DHF patients.

Keywords : mosquito nest eradication (PSN) , Mobility. DHF. Surabaya.

INTRODUCTION

Dengue fever is a public health problem and is endemic in nearly all districts / cities in East Java. In 2010, the incidence of dengue fever in East Java reached 25 762 cases with a mortality rate of 230 souls; declined sharply in 2011 reached 5,374 cases with a mortality rate 65 souls; and in 2012 again increased the incidence of dengue fever in East Java reached the 8266 incident with the death toll reached 119 people (East Java Provincial Health Office, 2013). Based on data from the East Java Provincial Health Office until June 2013, there have been 11 207 dengue incidence with Figures Genesis (Incidency Rate = IR) CFR 29.25 and 0.88% (99 people). Based on the same report, in Surabaya number of events are 1,504 events with CFR 0.4% (6) (East Java Provincial Health Office, 2013). Surabaya is a city with the highest IR dengue fever in East Java. As a comparison, Malang and Jember, ranked second and third IR dengue fever in East Java indicate numbers 2,506,102 and 2,375,469 cases from January to June 2013 (Surabaya City Health Office, 2013).

Surabaya is one endemic region in the province of East Java. Increased incidence of Dengue Hemorrhagic Fever (DHF) occurred from year to year. If in 2012 incidencerate DBD sebesar13,56 per 100,000 population in 2013 increased to 50.1 per 100,000 population and in 2014 to 110.2 / 100,000 population, by the end of March 2015 the number of incidence of dengue has close to 1,000 events, so the City Government Surabaya set several villages in Surabaya as areas with high endemicity.

Increasing the number of incidence of dengue in the city of Surabaya to influences the behavior of individuals in the implementation of PSN this can be seen by the low

numbers of larva free is <95% of the provisions of Ministry of Health of Indonesia. Another factor is the mobility of the population both in endemic areas stricken nobn existing endemic dilingkup city of Surabaya. In addition banyakknya puddles or water storage areas that are not well managed resulting in many breeding places of the *Aedes aegypti* mosquito as a vector of dengue(WHO,2006). This study aims to determine the cleaning habits of mosquito nest (PSN) and the Care of closing and bury (3 M) and the incidence of Dengue Hemorrhagic Fever (DHF) in the city of Surabaya.

METHODS

This study used case control design with a population that is the entire population of the city of Surabaya, a minimum of 1 year in the population have been living in Surabaya. As the study sample population is suffering from dengue were examined clinically by medical personnel and listed on the Surabaya City Health Department cases and people who are not suffering from dengue as controls. Control eligible were all residents of the city of Surabaya same age or the same age as the age of the case (when the cases or controls aged <14 years (adults) Interviews were conducted with respondents' parents. The number of samples in a study of 300 people, collecting data through interviews with the enclosed questionnaire and observation residential neighborhood settlements with the observation sheet. Data collection was conducted in June 2015 to August 2015. stratification analysis was conducted in order to control some variables covariates of the possibility of interactions between variables potensila risk factors or the presence of confounding factors of each covariate to the risk factors the main study. A multivariate analysis is used to see the association relationship between the main risk factors of the influence of several other risk factors (covariates) in conjunction with kejjadia Dengue Hemorrhagic Fever (DHF), multivariate analysis will be done using analysis *sunconditional logistic regression* (for data analysis control case does not correspond).

RESULTS

Various variables were observed distributed in cases and controls, indicating that it has met the criteria vaeriabel confounding sdeperti table below.

Table 1.Distribusi Characteristics of respondents in the case group and the control group

Characteristics	**Categories**	**Control**		**Cases**	
		n=150	**%**	**n=150**	**%**
Sex					
	man	52	61,73	60	42,52
age	0–14year	2	1,48	15	7,39
	15–49year	106	52,22	104	77,34
	>50Year	42	46,30	31	15,27
Work	No risk	40	19,21	56	32,51
	Risk	110	70,79	94	77,49
History	There is no	100	61,72	49	35,12
	There is	50	48,28	80	74,88
Water reservoir	no	70	49,75	70	73,40
	Threre is	80	50,25	40	26,60
Drain	Yes	142	76,35	108	82,71
	No	48	23,65	02	17,29
Close	Yes	124	61,08	66	32,51
Bury	No	79	38,92	137	67,49
	Yes	61	29,56	33	16,26
Anti mosquito	No	143	70,44	170	83,74

	Do	76	37,44	48	23,65
Anti Mosquito	Do not do	127	62,56	155	76,35
	Do	76	50,25	32	15,76
repellent	Do not do	74	49,75	11611	84,24
	Do	100	77,83	37	47,78
	Do not do	50	22,19	106	52,23
	Do	44	21,60	107	62,57
Prevent bite	Do	45	36,96	25	22,17
	Do not do	51	41,38	18	15,27
mosquito nest	Do 2 and 3M	52	32,02	109	63,55
	Do 1M	41	34,98	30	29,56
	Do not do 3M	57	33,00	11	6,90

Tabel 2. Bivariat Value Analysis The relationship between independent variables premises n incidence of dengue in Surabaya in 2015

Behavior	**Categories**	**OR(Crude)**	**95% CI**
Do PSN	Do 2and3M	1,00	*Reference*
	Do 1M	2,37	1,45-3,80
	Do not do 3M	9,49	4,80-19,56
Kovariat			
Prevent	Do 2and3Prevent	1,00	*Reference*
	Do 1Prevent	4,90	2,82-8,22
	Do not do	5504	3,81–9,60
SEX	Female	1,00	*Reference*
	man	2,23	1,46–3,40
Age	≥45years	1,00	*Reference*
	15–44years	0,32	0,20-0,50
	0–14 years	4,77	2,92–7,93
Mobility	No risk	1	*Reference*
	Risky	2,03	1,25-3,29
History DHF neigbourd	No	1,00	*Reference*
	yes	2,79	2,06-4,97
Container *	no	1,00	*Reference*
	yes	2,88	1,80-4,31

*) For an object that can hold water around the house

Table 3. Analysis of the multiple logistic regression PSN behavior and incidence of dengue in Surabaya in 2015.

Variable	**Coef.**	**Std.Err.**	**P>|z|**	**OR**	**[95%CI]**
Do 2M or3M				**1**	*Reference*
Do 1M	0,80	0,26	0,01	**2,22**	1,32-3,72
Do not do 3M	1,77	0,37	0,01	**5,85**	2,86-11,99
History DHF	1,02	0,25	0,01	**2,78**	1,69-4,56
Container	0,92	0,25	0,01	**2,50**	1,52-4,12
Prevent					
Do prevent	1,33	0,28	0,01	**3,79**	2,18-6,58
Do not	1,89	0,30	0,01	**6,65**	3,67-12,04
_cons	2,23	0,27			

DISCUSSION

After analysis on a group of people who do not do 3 M will be at risk 4.89 times greater than did the 3 M results of this study in accordance with the theory of WHO in 2006 that 3M is the act of the decline of the breeding place or breeding places of the mosquito-borne dengue ie *Aedes aegypti*. (MOH, 2005).Their breeding resulted in increased populations of mosquitoes so mosquito bites is also high-level contact with mosquitoes or too high so that the risk of dengue transmission by mosquitoes would be higher as well. Habits of people in saving water also increase mosquito breeding places. Participation in the PSN should be formed through socialization either through electronic media or other media. Socialization is done by mothers Jumantik or dasawisma not much to give additional action to 3 M, because at the time of data collection in June-August 2015 is a period where the water is very expensive. So that people are trying to save water for the purpose of saving water. (East Java Provincial Health Office. 2013)

Mobility of the population in the study area is quite high, as it relates to jobs and schools. Although mobility only in the scope of the city of Surabaya, but the mobility of people entering the area / village non-endemic to endemic villages of 31 districts and 162 villages in Surabaya 80% is included endemic villages and the rest are potential areas endemic. Population Mobility potentially spread of dengue in the city of Surabaya. From Surabaya Environmental factors have an average temperature of 20-30 ° C and an average humidity of 60-80% allows the Aedes aegypti mosquito optimized so easy to transmit and spread the dengue virus to the Society (gubler , 2002; WHO, 2006).

CONCLUSION

There is a highly significant relationship between behavioral Cleaning mosquito nest (3 M), Mobility of Genesis Dengue Hemorrhagic Fever (DHF) in the city of Surabaya. People who do not do 3 M 4 times higher risk of contracting dengue fever than did 3 M.

SUGGESTION

In addition to socialization mosquito nest eradication (PSN) needs to be done larviciding and 3 M of housing and residential environment, particularly areas that never existed DHF patients.

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THE RELATIONSHIP BETWEEN FOOD HANDLERS WITH THE IMPLEMENTATION OF FOOD HIGIENE SANITATION (IN RESTAURANT THE WORK AREA SEA PORT KKP CLASS II PADANG) OF 2016

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ABSTRACT
Higiene and sanitation of food is one of the preventive efforts to free the food from any dangers that may interfere with or damage the health. Application of hygiene and sanitation for the entire process is done well in sorting the raw materials used, during processing, up to the process of presenting. In report of BPOM RI in 2009, that the number of victims of food poisoning as many as 7815 people with the number of cases as many as 3,239 cases. In 2012 only 11 cases of poisoning in West Sumatra.This study aims to determine the application of food higiene and sanitation at the processing stage at home eating sea port work area KKP class II Padang in 2016. This research is descriptive analytic with cross sectional study design and done in-house dining Seaports work area KKP Class II Padang months from March to June 2016. Sample size as many as 46 people were taken using total sampling technique. Data was analyzed by univariate and bivariate using Chi-square test. The results showed as many as 54.3% of food handlers have application in food sanitation higiene is poor, 69.6% have a low level of education, 47.8% had low knowledge, 43.5% had a negative attitude and 76.1% never took part in the training , Based on bivariate analysis showed no significant relationship between the level of education (p = 0.00), knowledge (p = 0.03), attitude (p = 0.03) and the participation of courses / training (p = 0.01) of food handlers with the application of sanitary food higiene. Variables associated with the implementation of sanitary higiene in the food processing stage is the level of education, level of knowledge, attitudes, and training participation. Suggested for class II KKP seaports Padang to provide assistance in improving the supervision and counseling to food handlers, as well as for restaurant owners to provide higiene and sanitation facilities for food handlers working in restaurants.

Keyword : Higiene Sanitation, food handlers

INTRODUCTION

Health development in the period 2015-2019 is Indonesian Healt program with the goal to improve the health and nutritional status of the community through health and empowerment through community efforts are supported with financial protection and health care pemeratan. One of the main targets RPJMN 2015-2019 is the increased control of the disease (Menkes, 2015).

Society needs to be protected from the food and drinks that do not meet the requirements of sanitary hygiene-run restaurant that does not endanger health. Food safety is the community needs, because the food is safe will protect and prevent the occurrence of disease or other health problems. According Thaheer, a lot of things that can cause a food to be unsafe, either because of contamination (Kepmenkes, 2008).

Contamination in environmental health paradigm that occur in foods and beverages can cause the food is so media for a disease. Diseases caused by contaminated food called

foodborne illness (food borned diseases). According to the WHO in 2012, foodborne diseases such as diarrhea, dysentery, cholera and typhoid are public health problems that are a burden. The disease claimed many victims in human life and cause death. Foodborne illness is one of the leading causes of death in developing countries and causes 1.9 million deaths per year globally. Even in developed countries 1/3 of the population is infected with foodborne diseases (Adam, 2011).

Health Research (Riskesdas) in 2013, an infectious disease transmitted through food and beverages (foodborne diseases) based on the diagnosis of health professionals and respondent complaints consisted of 2.2% typhoid, hepatitis and diarrhea 1.2% 3.5%. This incident occurred in school-aged children (5-14 years), the incidence of diarrhea ranks the 5th largest after age groups, infants and the elderly, namely by 9.0% (Permenkes 2011).

A preliminary survey conducted on 17 and 18 March 2016 to 10 food handlers of 5 Eating in the work area seaports CTF Class II Padang showed that food handlers do not apply labor as well, seen that the power of food handlers do not wash their hands with soap before preparing food as much as 80%, when you process food is still a lot of handlers who speak as much as 90%, do not wear aprons / apron by 100%, do not wear gloves in taking food 80%, do not wear headgear as much as 80%, smoking while processing food 50%, long fingernails in kadaan 60% and handlers do not close the wound 30%.

Based on the above background, the researchers are interested in doing research relationship with a food handler behavior penerapanHigiene food sanitation at the processing stage at home eating Seaports work area KKP Class II Padang 2016.

MATERIAL AND METHODS

Samples

The population in this study were at home eating food handlers working area Class II CTF Sea port of Padang in 2016 amounted to 46 people from 16 Restaurant. The sample in this research is all food handlers in restaurants working area KKP Class II Sea port of Padang in 2016 amounted to 46 people from 16 Restaurant.

Methods

This type of research is analytic survey with cross sectional design, which is an approach that character for a moment in time and is not followed within a certain period of time, to determine the relationship of the behavior of the application of sanitary hygiene in food handlers in the food processing.

The technique of taking the research subjects were using total sampling. Total sampling is a sampling technique in which the number of samples is equal to the number of population. The reason researchers took a total sampling because the number atan populsi slightly less than 100.

RESULT

Table Relationships Education Level At this stage of food handlers with Application Processing Sanitation Hygiene Eating food in the Work Area KKP Class II Sea port of Padang 2016

Level of education	Food Sanitation Hygiene				Total		*P Value*
	Not Good		Good				
	F	%	f	%	f	%	

Low	20	71,4	8	28,6	28	100	
Hight	5	27,8	13	72,2	18	100	0,009
Total	25	54,3	21	45,7	46	100	

Application of the hygiene and sanitation of food-processing stage of food hygiene poor food sanitation are more prevalent among respondents with low education levels (71.4%) compared to respondents who have a higher education level (27.8%). Statistical test results obtained p value of 0.009 (p <0.05), meaning that there is a significant correlation between level of education and hygiene and sanitation of food

Table Knowledge Level Relationship with Food Sanitation Hygiene In Phase Treatment at Home Work Area Seaport KKP Class II Padang 2016

Knowledge level	**Food Sanitation Hygiene**				**Total**		***P Value***
	Not Good		**Good**				
	f	**%**	**f**	**%**	**f**	**%**	
Low	21	80,8	5	19,2	26	100	
Hight	4	20,0	16	80,0	20	100	0,000
Total	25	54,3	21	45,7	46	100	

Application of sanitary hygiene food hygiene food processing stage of food of poor sanitation is more common in respondents with a low level of knowledge (80.8%) compared to respondents who have a higher education level (20%). Statistical test results obtained p value of 0.000 (p <0.05), artinyaterdapat significant relationship between the level of knowledge-with the hygiene and sanitation of food.

Table Relationships Attitudes to Food Sanitation Hygiene Application On Stage Processing Work Area at Home Spot Seaport KKP Class II Padang 2016

Attitude	**Food Sanitation Hygiene**				**Total**		***P Value***
	Not Good		**Good**				
	F	**%**	**f**	**%**	**F**	**%**	
Negative	22	64,7	12	35,3	34	100	
Positive	3	25,0	9	75,0	12	100	0,04
Total	25	54,3	21	45,7	46	100	

Application of sanitary hygiene food hygiene food processing stage of food of poor sanitation is more common in respondents with a negative attitude (64.7%) compared to respondents who have a positive attitude (25%). Statistical test results obtained p value of 0.04 (p <0.05), artinyaterdapat antarasikap a meaningful relationship with the hygiene and sanitation of food.

Table Relations Participation Course / Training with Food Sanitation Hygiene Application On Stage Processing Work Area at Home Spot Seaport KKP Class II Padang 2016

Course / Training	**Food Sanitation Hygiene**				**Total**		***P Value***
	Not Good		**Good**				
	F	**%**	**f**	**%**	**f**	**%**	
Ever	23	63,9	13	36,1	36	100	0,03

Never	2	20,0	8	80,0	10	100
Total	25	54,3	21	45,7	46	100

Application of the hygiene and sanitation of food-processing stage of food hygiene poor food sanitation is more common in respondents who never took courses / training (63.9%) compared to respondents who never took courses / training (20%). Statistical test results obtained p value of 0.03 (p <0.05), artinyaterdapat meaningful relationships antarakeikutsertaan courses / training in hygiene and sanitation of food.

CONCLUSSION

Based on the results of research on the behavior of food handlers relationship with food hygiene sanitation applied at the processing stage at home eating sea port work area KKP Class II Padang 2016, can be Saved. The existence of a significant relationship between the level of education, level of knowledge, attitude, availability of restaurant facility, with the application of the hygiene and sanitation of food-processing stage by food handlers at restaurants seaport working Areas KKP Class II Padang 2016.

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ENVIRONMENTAL HEALTH RISK ASSESSMENT IN BONETAMBUNG ISLAND OF MAKASSAR CITY

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ABSTRACT
Bonetambung island is one of the small isolated island, which located at western of Makassar City. Limited transportation access and poor sanitation facilities are still a problem. This research aimed to get an overview of environmental health risks on the island of Bonetambung. A descriptive study on households was used and 102 households were taken as sample by using exchautive sampling method. The are some environmental health hazard identified in this island consist of water-related hazards (71,1%), domestic wastewater (71,2%), and ownership of solid waste disposal facility (72,5%). Some unhealthy behavior that categorized as exposure, involves poor handwashing practice (54,2%), Open Defecation Free (ODF) (62.7%), solid waste management (96,1%), and unboiled drinking water (25.5%). The conclusions of this research are the assessment found that environmental health risk assessment level in Bonetambung Island were different by neighbourhood area (RT). Then highest risk is in RT 03, high risk category in RT 01, and low risk is in RT 02
.
Keywords: Risk assessment, environmental health, island

INTRODUCTION

The small islands and all the problems are not only on the problems of environment and development. The small size, the challenge of coastal zones are concentrated in limited land, limited resources, geographic dispersion and isolation from markets, placing small islands at a disadvantage. Societies that live in small islands and isolated, will be exposed to health risks, among others, the lack of availability of clean water quality, lack of availability of nutritious foods and limited medical services from the public sector especially during hurricane season. Housing conditions are solid and less qualified health so easily infected with vector and a growing disease agents, also supports the creation of poor sanitation. In addition, the characteristics of the isolated small island communities, lack of understanding the importance of sanitation for health, one of which caused a lack of knowledge. So the behaviour-related risk behavior of health allows it to happen.

Nationally, basic sanitation or the dangers that arise from environmental problems and risk factors as well as hygiene unhygienic behavior or risky, accounted for 19% of the world's deaths due to infectious diseases. Environmental health problems in Indonesia, in this case is a means of sanitation in small islands are still very poor condition which is characterized by the still high number of occurrences of infectious diseases and communicable diseases in the community. Mukherjee said that the prevalence of diseases caused by poor sanitation in Indonesia is a diarrheal disease amounted to 72%, kecacingan 0.85%, 23%, scabies trakhoma 0.14%, 0.57% of hepatitis A, hepatitis E 0.02% and the malnutrition 2.5%.

A number of studies have been done mainly to investigate determinants of health indicators and factors between some of the countries that are included in the category of small islands, but only a small part of the course that specifically focus on the country consisting of thousands of large and small islands such as Indonesia, Japan, Malaysia, and

the Philippines. Some of the main environment-based disease has also been found as a disease endemic in the region among other islands such as malaria and leptospirosis. However, essentially the health problems faced by the residents of the island still in domination by the environmental health issues and unhealthy behavior.

Bonetambung island is one example of a small island that lies to the West of Makassar city and is an island with marine transportation access is limited or not available in the regular transport to the island. This condition then be load dual (double burden) for coastal regions and small islands, thus the need for a study of environmental health risk assessment to get an overview of environmental health hazards and unhealthy behavior and find out areas of risk-prone environment based on risk mapping using the Index Value Environmental Health Risks (IRKL).

METHOD

This type of research is descriptive. This research was carried out on the island Bonetambung Makassar city in March – April 2014. The population in this research is the entire household is on the island of Bonetambung. The sample in this research are all households that are on the island of Bonetambung which totalled 102 households and respondents in this research are the residents, both housewives as well as heads of households who are at least 18 years old. Sampling done in exchautive sampling.

RESULTS AND DISCUSSION

The are some environmental health hazard identified in this island consist of water-related hazards (71,1%), domestic wastewater (71,2%), and ownership of solid waste disposal facility (72,5%). Some unhealthy behavior that categorized as exposure, involves poor handwashing practice (54,2%), Open Defecation Free (ODF) (62.7%), solid waste management (96,1%), and unboiled drinking water (25.5%). Based on the foregoing, the environmental health risk index obtained on the Bonetambung Island which is summarized on table 1, 2 and 3.

Table. 1 Environmental Health Risk Indeks (EHRI) in Bonetambung Island of Makassar City

Variabel	**Areas (RT)**		
	01	**02**	**03**
Water Sources	75	77	67
Domestic Wastewater	89	90	89
Household Trash	59	53	100
Unhealthy Behaviours	69	62	42
Total	292	282	298

Source: Primary Data, 2014

Table. 2 Categories of Environmental Health Risk in Bonetambung Island of Makassar City

	The Limit Value of Risk	Description
Total Index Of Maximal Risk	298	
Total Index Of Minimal Risk	282	
Interval	4	
Categories of At-Risk Area	**Lower Limit**	**Upper Limit**
Low Risk (1)	282	285
Moderate Risk (2)	286	289
High Risk (3)	290	293
Extreme Risk (4)	294	298

Source: Primary Data, 2014

Table. 3 Scoring of Environmental Health Risk in Bonetambung Island of Makassar City

Areas (RT)	Values of EHRI	Score
01	292	3
02	282	1
03	298	**4**

Source: Primary Data, 2014

The data obtained, shows that the majority of the households on the island of Bonetambung capitalize the well as a source of clean water for washing and other purposes, while for the purposes of drinking water, only a few are using the dig wells. When compared to the use of wells, the use of other water sources are relatively much smaller. The source of tap water/PDAM only used approximately 14.7% of households only for cooking and drinking, while for washing and so on water well still dominates and the rest use rain water. The proportion of the use of tap water/TAPS above applies only in the rainy season. Whereas, during the dry season the proportions will be greater. This is because the main source of clean water for drinking and cooking experience scarcity where rain water which became the main source of water have been exhausted at the time of the drought comes. Although the community has had an alternative main clean water other than rain water as well as tap water/TAPS, but this condition can still be said to be difficult. Because of the way the get tap water/TAPS was boughts. Water tap/TAPS comes from Makassar city brought in by fishing boat to the island of Bonetambung. Other sources even much smaller is bottled water packaging that covers only 1% of the population.

Transmission of the disease – infectious disease associated with oral-fekal can be controlled and prevented through good sanitation, but for small islands, there has been no fulfillment of human feces disposal systems (latrines). As for the procurement of Public sanitary facility that exists on the island of Bonetambung is only used by a small percentage of the existing staircase. The toilet facilities are there right now, already damaged by abrasion of the beach. Some research also tells us that a good sanitation can reduce the transmission of microbes that cause diarrhea in a manner to prevent contamination of human feces with the environment. Increased means of sanitation can reduce the incidence of diarrhoea amounted to 36%. Other research mentions the use of latrines can effectively reduce the incidence of diarrheal disease by 30%.

CONCLUSION

The conclusions of this research are the assessment found that environmental health risk assessment level in Bonetambung Island were different by neighbourhood area (RT). Then highest risk is in RT 03, high risk category in RT 01, and low risk is in RT 02. Environmental health hazards that exist on the island of Bonetambung include the dangers of associated source of clean water, domestic waste water, and ownership of the trash. As for the chances of exposure to environmental health hazards include, the behavior does not hand wash, ODF, is not to cultivate and manage waste, as well as the behavior of not drinking water processing.

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