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Cellular Immunity of River Water Consuments and Bandarmasih Municipal Waterworks Consuments

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ABSTRACT

The quality of water used for daily needs affects human health. Some people in Banjannasin use the PDAM Bandannasih water and some use Manapura River water. One of the infection signs is the increases of white blood cell. includes ncutrophil, monocyre. eosinophil and lymphocyte. The aims of this study was ddenninc the differences ofneutrophil. monocyte. eosinophil and lymphocyte count between Manupum river waterconsumcnts and Bandannasih Local Waler Supply Ulilityconsuments in Banjannasin. Tllis study was an unalytieobscrvational with ıı cross sectional npproach. Sample selection used purposive sampling technique. The result showed that ncutrophil, monocyte, eosinophil and lymphocyte count average level of 30 com,umenlli of Martapura River waler were 54.03%, 7.43%, 3.2%. 34.8%, rcspccli\vcly; and ncutrophil, monocyte. eosinophil and lymphocyte count average level of 30 consumenrs Bandannasih Local Water Supply Utility was 54.9%, 7.83%. 4.39%. 32.8o/,, respectively. Staristical annlysis with unpaired l-test showed dmt there wasn'l any diffcrcncc of nculrophil, monocyte, eosinophil and lymphocyle.count between MW1apum River water eonsumcnlS and Bandannasih Local Water Supply Utility consumcnts (p=0.723. p=0.822. p=0.623%, p=0.318) in AUb\Sl 2018 period.

Kl'ywortls: river water collsllmelllls, local water supply consllments, imm,mity. lellkocytes

lncroduclion

The river flow in the Province of South Kalimontan. cspcciolly the City of Banjarmasin. is used for various ecriviucs. The percentage of river water use by the people of the Alalak River lo clean their houses is 9So/,; lo water the plants 92o/,: lo bath 77%; to wash the clothes. the cooking utensils, and the eating utensils 74%: end fonhc nblution 1%.[1]

The more the activity of the people on the riverside grows. the higher the level of pollution in the waterduc to the direel household waste thrown away to the water."rhe huge amouru of waste disposal into the river will make the quality of water worse.As many as 34% of the people around the river in Banjnrmasin throw feces directly into the river and 64% use traditional septic tang *(cllbfok)* that do not meet the requirements of good sanitation. causing the surrounding environment to be polluted. It is very possible to find many bacteria, viruses, and parasites in polluted water+The baetcriologicnl test of river water in Bcrnngas. Darito Kuala showed that the MPN values of *Colifↀrm* and£. *Coli* are respectively 29 and 0 MPN/100 ml. The MPN value ofColifↀm,dropped ıo 18 MPN/100 ml in the river water which has been given alum.

Another cause of river water pollution in the city of Banjannasin is the disposal of domestic waste and factory waste into the river.' As the population increases, the effonsto fulfill the water needs arc increased through the Local Water Company (PDAM). The clean water in the city of Dmtjarrnasin is supplied by the PDAM Bandarmasih through the process of coagulation• flocculation. filtration. sedimentation and disinfe<:tation. Chlorineiso disinfectant commonly used by PDAM.iThis substance is capable of killing pathogenic bacteria and protozoa in the water ond inhibiting the growth of moss."The existence offrccchlorinc compound in the distribution ofwalcr penniued by PERMENK.ES 201Ois 0.2-0.5 mg.II.'

The microbiological qunlity of water provided by PDAM l3undarmusih is proven to be good lhrough the llnlllysill oftlie qunlity ofcustomers clean water of Water Treatment Plant (IPA)zone I PDAM Bandamrnsih on

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the period of June-July 2018, the amount of *E. Coli* and the total of *Coli* is 0 per 100 ml of water in the sample thatm<<ts the drinking water requirements.•

Neutrophils together with monocytes arc phagocytie cells and arc the first immune cells to respond during infection to fight bacteria.' Eosinophils play a role in allergic and parasitic infections.[10] Whereas lymphocytes are able to produce the body's defense components against foreign objects that have been specifically identified. There are B lymphocytes that function in humoral immunity and produce antibodies in the blood. and T lymphocytes as cellular immunity that does not produce antibodies. but works directly to destroy specific foreign objects with chcmicals.v's

The poor water quality, especially microscopically. increases the risk of infection for its users, one of which is an increase in the number of leukocytes. Based on the description above. a study was conducted to determine the differences in the number of ncutrophils. monocytes. lymphocytes and cosinophils of Manapura River water users with water users of PDAM Bandarmasih.

Research Materials and Method

The implement:llmn of this study was using an observational analytic cross sectional method. The population of this study is the people using the water from Manapuro River on Ray Street 17 RT.02 Bcrangas District with a total population of 155 people and the people using the water from PDAM Bandarmasih on Maluku Street RT. 05 Pasar Lama District with a total population of 176 people for daily needs in Banjarmasin City in August 20 18.

Hesults

The Shapiro-Wilk test showed that the data on the number of ncutrophils and lymphocytes of river waler user group and PDAM water user group spread out normally. The data onthe number of eosinophils and monocytes were not normally distributed. hence data transform.:ition was carried out. After all data were normally distributed. it was followedby hypothesis testing with unpaired *t*. the results showed that there were no st.:itistically significant differences in the number of ncutrophils. monocytes, lymphocytes and cosinophils between the two groups of research subjects with *p* values of0.723, 0.822. 0.623 and 0.318.

liable I: Characterhcin or Rc,pondents or Water Usen of Rtveron Ray Street 17 and \\•ter Userser l'DAMon Mltluku Srreet inAui;tust 2018 according to Gender. Range or Age, Current Disease llistory (RPS), Drug Consumplion I listory and Neulrophil Levels

	Category	Group			
		water User of Rh'er		\\ater User of PDAM	
		[illegible]	[illegible]	[illegible]	[illegible]
l	Gender				
	Female	l9	63.3	23	76.7
	Male	l1	36.7	7	23.3
2	Range of Age (year)				
	l8-31	5	l6.7	3	lO
	32-46	l3	43.3	l8	60
	47-60	l2	40	9	30
3	Current Disease History (RPS)				
	Pam	2	6.66	2	6.66
	Hypertension	0	0	l	3.33
	Hypcrcholcstcrol	0	0	l	3.33
	Anemia	0	0	l	3.33
	Diabetes mellitus	0	0	2	6.66
4	Drug Consumption llislory				
	Antihipcrtcnsi	4	l3.33	l	3.33
	NSAID	2	6.66	2	6.66
	Anticholeslcrol (srntins)	0	0	4	l3.33
	Contraception (binh control pill)	2	6.66	2	6.66
	Antipyrctic	l	3.33	l	3.33
	Ulcer medication (antacid & l12-receptor antagonist)	2	6.66	3	lO
	Chlorpheniramine maletue	l	3.33	l	3.33
	Anti gout	0	0	l	3.33
	Antihyperglycemic	0	0	Z	6.66

Table 2: Results or Laboratory Test or Waler from PDAM Bandarmllsih on Maluku Street. RT 0S. Banjarmasin and Water from Marlapura Ri,tr on Ray Street 17, RT 02, Beraegas "ilh and "ilhout Alum

Parameter	Maximum Limit	River Waler	River water wilh Alum	PDAM weter
I. Physics				
Color	:515	19.7	2	5
Turbidity(NTU)	S5	84.6	0.1	1.27
Temperature (C")	Air lemperature ± 3	26.9	26.9	26.5
2. Chemicals				
Chlorine{mg/L)	•-2	-	-	0.82
Aluminium (mg!L)	6.5-8.5	0.55	1.25	-
Iron (mg/l)	1.0	2.24	0.09	-
Lend (mg/l)	0.2	0.38	0.1	-
3. Uartuiololllieal				
£. *Coli* (MPN/100 m1)	0	0	0	0
MPN *Coli* (MPN/100 ml)	0	50	18	0

Table J: A,erlige Number or N,ulrophils. Monot)IH. Lyrnphecytes and Eosinophils in Respondents o"\'aler Users or Rtveren Ray Street 17, RT 02. BeranJ!as and Waler Users or PDAM 8llndarmasih on Maluku Street. RT 0S. 8anjarmllsin in the Period or August 2018

#	Cat('g0r)'	Group or User Respondent ◊hrtapura Rtver \\Valer N	-;.	POAM \\Valer N	•;.
1.	Monocyles				
	Average	30	7,43	30	7.54
	Nomml	20	6,36	18	6.28
	Monocytosis	10	9,57	12	9A
	Monocytopcnia				
2.	Neulrophils				
	Average	30	54,03	30	54.9
	Normal	19	57,2	18	59.25
	Ncutropcnia	9	42.3	11	46.2
	Neutrophilia	2	77		72.6
3.	Eosinophils				
	Average	30	3.21	J0	4,39
	Normal	14	2.8	9	3
	Eosinopenia	9		9	1.2
	Eosinophilia	7	7	12	7.9
4.	L)mphocytes				
	Average	30	34.8	30	32.8
	Normal	19	31.4	21	31
	Lymphocytosis	9	46	5	42.5
	Lymphocytopenia	2	17.5	4	22.7

Discussion

The average number or each cell lype is almost entirely within the normal range. bolh in the group or the river water users and thegroups of rhe PDAM water users.Only the average number of cosinophils of PDAM water users has increased from the normal value (4.39-!.). The statistical results showed that there were no significant differences in the number of ncutrophils, monocytcs, lymphocytes and cosinophils between the two groups of respondents. this could be due to the two groups of respondents giving direct trcatmcnl of water to be used. namely deposition. alum and boiling which could interfere with the sustainability of the pathogenic bacteria in the waler thereby reducing the risk of infection for users. ln addition. the use of soap. toothpaste and other cleaning ogents can kill pathogenic microorganisms because they arc antibectcriel.

The river water used by the people on Ray Street 17, Bcrangas for daily activities. especially kitchen needs is always accommodated and given the alum which functions as a floculator where its activities are 10 agglomerate pollutants such as indusirial residues, metals, and microorganisms and are known also as an antibacrerial't.Alum can inhibit the bacterial growth. The concentration of alum as much as 1% makes gram-positive bacteria experience a death phase, and the concentration of 2"/e causes the death of gram-negative bacteria.

The disposal of soap and detergent waste into the river results to aworse quality of river water. However,

alum can reduce detergent levels by absorbing dyes and other pollutanis. and alum is effective in reducing iron levels in water.u

Particularly for drinking water. besides being given alum. it can also be boiled. The bacteria and the ocher pathogens in the water that go through a cooking process *to* HXl°C for 5-10 minutes will disappear."

Maluku Street. Pasar Lama are fulfilled with the water from PDAM Bandannasih. The water has been given chlorine as a disinfectant. The results of qualitytcst of PDAM water (table 2)are in accordance with the standard. where one of the indicators. known as the value of water turbidity. is not more than 5 NTU. It is because the high value ofturbiditywill reduce the disinfection activity during the processing of water purification.[15] The disinfection will work effectively if the free chlorine in the water amounts to between 0.2-0.5mg/1. if the disinfecuition is less. it will not be effective. andif it is more. it will be carcinogenic."

The disinfection process of water from PDAM Bandarmasihis proven to be good. according to the lab results in June 2018 showing that the MPN values of *Coliform* and £ Co/iare 0 per 100 mL.[11] Therefore, the water flow that reaches the people's houses is of good quality and free of pathogenic microorganisms. This is in accordance with the results of the study that the average number of ncutrcphils, monocytcs and lymphocytes using PDAM water on Maluku Street. RT02. Banjarmasin is in the normal range.

In addition to the direct treatment of water used. people in both locations also use soap for bathing. washing dishes and ocher eating utensils. and toothpaste for brushing their teeth. One oft he ingredients contained in toothpaste is flour which is antibacterial. The use of toothpaste with flour has been proven to be effecnve in killing bacterial colonics.[11,"] The antibacterial content found in toothpaste is baking sodn (sodium bicarbonate). Baking soda is alkaline which can neutralize the pH of the oral cavity, so that it can inhibit the bacterial metabolic activity. Baking soda also has hypcrtonic activity which later results in hypolonic content of water-losing bacteria which will make the bakery cells become dehydrated and can eventually destroy the bactcria.!t.![l]

Ordinary soap (noc llntibactcria can reduce *50"!.* of pneumonia in infants and 53% of diarrhea in children under 15 years old.And there is no significanl difference between anlibactcrial soap and ordinary soap in it.s effectiveness in killing bacteria."

Although there were no statistically significant differences between the ncutrophil counts of the two groups of respondents. there were variations in the number of respondents between the two groups of re ndents. This was robabl due to the differences in the environmenlal characteristics of the two research locations. Maluku Street is a market area with dense environmental characlcristics. The houses and the merchant stalls arc located side by side on both sides of the road with a large number of local people and market visitors.An environment with a huge amount of population and a minimum amount of air ventilation can increase the density of germs or bacteria.ll The people around such location have a higher risk of exposure to bacteria. Meanwhile. on Ray Street 17. Bcrangas District. it looks cleaner.

Gender also affects the number of leukocytes. In this study, the number of female respondents in the group of river waler users (19 people) was less than the female respondents in the group of PDAM water users (23 people). The immune response of women rs faster to respond toinfccuoncompared to the immune response of men. When an infection occurs. a woman's immune system recognizes and destroys pathogens lhat enter the body more quickly than men.i,

Conclusion

Based on a study of the difference in the number of leukocytes ofusers of water from Martapura Riverand users of water from PDAM Bandarmasih. it was concluded that the average numbcn of neutrophils and monocytes. lymphocytes and cosinophils of the people using the water from Manapura River in August 2018 were 54.03%. 7.43%. 34.8o/t and 3.2%. The average numbers of ncutrophils. monocytes. lymphocytes and eosinophils of the people using the water from PDAM were 54.9%. 7.54%. 32.8% and 4.390!.. respectively. The statistical results showed no significant differences between the average number of ncutrophils. monocytcs. lymphocytes and oosinophils of\hc waler uscrsof Martapura Rivernnd the water users of PDAM Bandannasih.

Soeree or Funding: Domestic government

Conflict of Interest: There is no conflict of interest in this study.

Ethical Clearance: This study obtained a label of elhics escaped by the number:761/K£PK-FKUNLAM/EC/VIIU2018 on August 10. 2018

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