ANWAR_MALLONGI__Issued_Papers.pdf

by

FILE	ANWAR_MALLONGI__ISSUED_PAPERS.PDF (9.08M)		
TIME SUBMITTED	05-NOV-2019 05:40PM (UTC+0700)	WORD COUNT	3225
SUBMISSION ID	1207465967	CHARACTER COUNT	15578

ISSN-0976-0245 (Print) • ISSN-0976-5506 (Electronic)

Volume 10 | Number 7 | July 2019

Indian Journal of Public Health Research & Development

An International Journal

SCOPUS IJPHRD CITATION SCORE

Indian Journal of Public Health Research and Development
Scopus coverage years: from 2010 to 2018. Publisher: R.K. Sharma, Institute of Medico-Legal Publications
ISSN:0976-0245E-ISSN: 0976-5506 Subject area: Medicine: Public Health, Environmental and Occupational Health
CiteScore 2017-0.03
SJR 2017 - 0.108
SNIP 2017- 0.047

Covered by Scopus
EMBASE
Approved by MCI

Website:
www.ijphrd.com

Calculation of Potential Risks Assessment of Escherichia coli and Total Coliform in Communities Well Water of Puty Village, Luwu Regency

Anwar Mallongi[1], Herlianti [1], Hasnawati Amqam[1], Dwia Aries Tina Pulubuhu[2], Muhammad Arsyad[3], Muh. Saleh Jastam[4], Muhammad Rachmat[5]

[1]Environmental Health Department, Faculty of Public Health, Hasanuddin University, [2]Faculty of Social and Political Sciences, Universitas Hasanuddin, Makassar, Indonesia, [3]Faculty of Agriculture, Universitas Hasanuddin, Makassar. Indonesia, [4]Lecturer in Public Health Faculty, Universitas Islam Negeri, Makassar Indonesia, [5]Department of Health Promotion and Behavioral Science, Faculty of Public Health Hasanuddin University, Indonesia

Abstract

This study aims to determine total coliform present in water and to determine the health risk to the people who consume water contaminated by bacteria. The research was a cross observational study with microbe risk analysis conducted in Puty Village of Bua District, Luwu Regency. The sample consisted of 15 drilling wells and 34 respondents who owned drilling wells selected using purposive sampling method. The data was analyzed using MRA method and Excel programs. The results of the research indicate that the average concentration of total coliform in drilling water among 15 samples is 130-160.000000 MPN / 100 ml water. Meanwhile, for E. coli the average concentration in water exceeds the standard of drinking water quality, i.e 23-24000 .000 cells/100 ml while the standard drinking water quality should be 0/100 ml water. The amount of risk for public who consume water contaminated by bacteria is in a high risk on average. The results of risk analysis indicate that the highest Probability of infection (P_inf/day) of Escherichia coli bacteria contamination in water among 15 samples is sample 5, i.e $2.40E^{-04}$. Probability of infection/year (P_inf/ year is $874E^{-2}$, while probability of illness (P_ill) is $1.28E^{-2}$). Therefore, this is in a high risk category which means that it is risky of a disease.

Keywords: *Microbial Risk Analysis, Escherhicia coli, total coliform*

Introduction

Average water needs by Indonesia people is 60 liters per capita, include: 30 liters for bathing purposes, 15 liters for drinking purposes and the rest for other purposes[1]. The presence of this group of bacteria used as an indicator of a product has been contaminated by fecal matter, namely bacteria residing with feces or feces. This is due to the natural habitat of these bacteria group is in the feces of humans and other warm-blooded animals.

Corresponding author:
Anwar Mallongi
Email: anwar_envi@yahoo.com;
anwarmallongi@unhas.ac.id

Data by Riskesdas[2], the use of clean water that is most widely used for domestic purposes is protected dug wells amounted to 27.9% and boreholes or pump by 22.2%. Whereas, for the purposes of drinking water is the most widely used is protected dug wells amounted to 24.7% and boreholes or pump by 14%. These wells, if not addressed properly, has the potential to be contaminated with Escherichia coli.

Many risk factors are thought to cause diarrhea in Indonesia. One risk factor is often studied environmental factors including microbiological quality of water, the presence of pathogenic bacteria in the water, such as the bacterium Escherichia coli the most dominant risk. Factors contribute to diarrheal diseases are water, hygiene and sanitation (availability and ownership of

latrines, trash), the transmission through food, waste water and air[2].

A study of risk factors for the incidence of diarrhea by Natsir et, al.,[3], found that poor sanitation relationship with the incidence of diarrhea which gained frequency distribution of clean water a bad category of 199 (90.5%) of 220 respondents; Poor handling of waste by 171 (77.7%); bad excreta disposal facilities by 124 (56.4%). While the frequency distribution of bacteriological water quality examination showed that of 218 (99.1%) positive water samples E. coli. The World Health Organization (WHO)[4] reported the disease caused by the bacterium Escherichia coli that hit Germany and 11 other countries in Europe up to now has reached 2,260 cases and resulted in the death of 22 people. Until June 5, 2011, Germany has reported the incidence of 1,536 cases of EHEC (Escherichia coli entorohemoragik) which is an increase of 108 cases from the previous day and resulted in the deaths of six people.

Assessment approach associated with the procedure MRA can assist the risk assessment to characterize the source of exposure, the causative agent associated with symptoms, and other factors that contribute to the emergence of disease MRA has become a method is growing rapidly that systematically combines available information on exposure and dose-response to produce estimates the burden of disease associated with exposure to pathogens[5]. MRA expressed great risk in the value P infection (P inf) or P illness (P ill). This study aims to determine the risk of contamination of Escherichia coli and total coliform in wells water to public health.

Materials and Method

Research Methods

This study used an observational study design with the approach of microbial risk analysis (MRA) to determine the health risk that would occur if infected by bacteria in the water.

Research Sites

This research was conducted in the village of Bua Puty districts during 2 months from May to June.

Population and Sample

The human population in this study are all people who consume water from well. For human sample in this study were 34 people who have dug well water samples was 15 samples. Sample is determined by purposive taken one time. Bacteria that become research object were Total coliform and Escherichia coli bacteria that present in water wells in the test laboratory. Sample Environmental health techniques for determining the amount of the concentration of bacteria in the water wells. Concentration results in analysis with Quantitative Approach Microbial Risk Assessment (QMRA) to determine how much the probability of Escherichia coli bacteria can cause infection (P infection) or disease (P illness) in the community.

Data Collection

Primary data obtained from the test results laboratories ie the number of E. coli and total coliforms in secondary Makassar. Data BTKL-PP obtained from recording data related to the community of Bua district office, health office and health center Luwu Bua about 10 highest diseases and the number of facilities 2014 clean water.

Data analysis

Data were analyzed using Analysis of Quantitative Microbial Risk Assessment (QMRA) which cover of Hazard Identification, Exposure Assessment, the analysis of dose response Risk characterization), and Risk Management. Presentation of data in tabular form accompanied by narration.

Research Results

Results showed that the number of E. coli and total coliform bacteria in wells water in the village Puty that used as sources of drinking water are not eligible for direct consumed. It present concentration of bacterium of Escherichia coli and total coliform. The result of temperature, and pH of the water wells test and analysis were also not meet requirement at all. The concentration of total coliform bacteria in water (Table 1) shows that water samples from 15 wells tested were not safe for consumption without treatment, the highest sample Total coliform at sample 5 with 160 million cells / 100 miles of water, and the lowest total coliform samples was at 130 cells / 100 miles of water at well number 15. In the sample (Table 2) shows the concentration of bacteria E.coli from 15 well water were tested all the samples showed no feasible and highest sample Escherichia coli bacteria

was on 5 sample that is 24 million cells / 100 miles of water and a sample of the bacteria Escherichia coli lowest 20 cells / 100 miles of water.

Table 1. Laboratory Test Results Total Pollution Total coliform in dug well water in Bua District, Luwu Regency in 2015

Samples	Location	Total Coliform/100 ml	Maximum Allowance	Feasibility	Method
1	RW 1	9200	Base of the regulation PERMENKES RI NO.416/MEN. KES/PER/IX/1990 50 for water air non pipe /IX/1990	Not Feasible	APHA 2005.9221 B
2	RW1	5400		Not Feasible	
3	RW 1	230		Not Feasible	
4	RW 11	24.000.000		Not Feasible	
5	RW 11	160.000.000		Not Feasible	
6	RW III	1.600.000		Not Feasible	
7	RW III	3500		Not Feasible	
8	RW IV	1600		Not Feasible	
9	RW IV	220		Not Feasible	
10	RW V	470		Not Feasible	
11	RW V	54000		Not Feasible	
12	RW VI	9200		Not Feasible	
13	RW VI	5400		Not Feasible	
14	RW VII	1700		Not Feasible	
15	RW VII	130		Not Feasible	

Table 2 Laboratory Test Results Number of Escherichia coli Pollution in dug well water in Bua District, Luwu Regency in 2015

Sample	Location	MPN E. Coly/100 ml	Maximum Allowance	Feasibility	Method
1	RW 1	23	0 for drinking water	Not Feasible	APHA 2005.9221 F
2	RW1	1700		Not Feasible	
3	RW 1	78		Not Feasible	
4	RW 11	23.000.000		Not Feasible	
5	RW 11	24.000.000		Not Feasible	
6	RW III	23000		Not Feasible	
7	RW III	240		Not Feasible	
8	RW IV	9200		Not Feasible	
9	RW IV	20		Not Feasible	
10	RW V	220		Not Feasible	
11	RW V	250		Not Feasible	
12	RW VI	400		Not Feasible	
13	RW VI	23		Not Feasible	
14	RW VII	45		Not Feasible	
15	RW VII	130		Not Feasible	

Table 3. Results of Quantitative Calculations Microbial Risk Assessment Source of Drinking Water in Puty Village, Bua District, Luwu District, 2015

Sample	Bacteria in water $C_{r)}$	Quality of Bacterial Concentration in Drinking Water (C_d)	Pathogen Exposure to Drinking Water (E)	Infection Probability Per Day (P_{inf})	Infection Probability Per year ($P_{inf,Y}$)	Probability of Gastrointestinal Disease (P_{ill})	Notes
1	23	0.0023	0.0023	-2.30E-10	-8.39E-08	1.28E-05	High Risks
2	1700	0.17	0.17	-1.70E-08	6.20E-06	9.48E-04	High Risks
3	78	0.0078	0.0078	-3.37E-08	2.84E-07	4.35E-05	High Risks
4	23.000.000	2300	2300	2.30E-04	8.38E-02	1.28E+01	High Risks
5	24.000.000	2400	2400	2.40E-04	8.74E-02	1.34E+01	High Risks
6	23000	2.3	2.3	2.30E-07	8.39E-05	1.28E-02	High Risks
7	240	0.024	0.024	2.40E-09	8.75E-07	1.34E-04	High Risks
8	9200	0.92	0.92	9.19E-08	3.35E-05	5.13E-03	High Risks
8	20	0.002	0.002	2.00E-10	7.29E-08	1.12E-05	High Risks
10	480	0.022	0.022	2.20E-09	8.02E-07	1.23E-04	High Risks
11	220	0.025	0.025	2.50E-09	9.11E-07	1.39E-04	High Risks
12	250	0.04	0.04	4.00E-09	1.46E-06	1.90E-04	High Risks
13	400	0.0023	0.0023	2.30E-10	8.39E-08	1.09E-05	High Risks
14	23	0.0045	0.0045	4.49E-10	1.64E-07	2.51E-05	High Risks
15	45	0.013	0.013	1.30E-09	4.74E-07	7.39E-05	High Risks

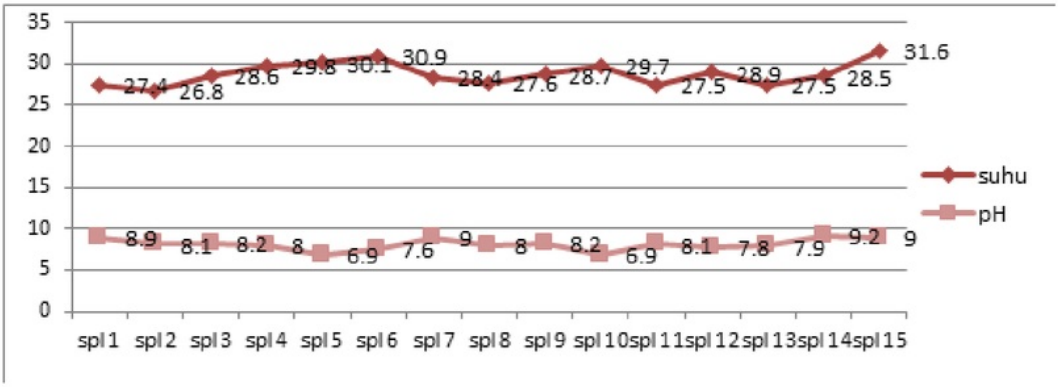

Figure 1. Graph of State Temperature and pH of well water dug as a source of drinking water.

Figure I shows temperature and pH in the wells as a source of drinking water with an average of pH between 6.9 -9.2 while the normal limit of the pH is 6-8, meaning the highest pH value there is in the sample 14 are in RW 7 marks that it is on the water because the acid levels over the limit. Whereas highest pH in the sample 14 is 9.2 with the sampling time at 15:40 on the exposure limits with low pH 6.5 and the highest 9.0. pH or acidity pH ranges of drinking water 5-8. While the value of water quality standards 31.6 where temperature ever on the samples 2 to 15 and 30.9 on the sample 6, and 3 on the sample 5 is the maximum allowed 30.1 (BMA) water quality standards (26-29 ^{0}C).

Quantitative Microbial Risk Assessment on wells as a source of drinking water.

Quantitative calculation results in microbial risk analysis aims to determine the dose response of the

probability of infection and the risk characteristics of the population of the village society Puty. Table 3 shows the probability of infection per day based om P inf. d = 1- (1 + E / β) ^ (- α) that people who consume water every day / 1 liter contaminated with bacteria E.coli then he will be infected with about 23954E^{-4} bacteria then categorized as high risk, while the probability of infection per year or infection due to consumption of water contaminated with bacteria during the year by the formula (P inf. d y = 365) was = 8,74327E^{-2} can be categorized high. And the risk for probability of gastrointestinal disease or (Pill = P inf. year x S x I = 13.3771209E^{-1} if the resulting percentage is the risk of clinical disease 50% the risk of disease is a high risk. Of the 15 samples of the lowest concentrations of the bacterium Escherichia coli is a sample 9 as 20/100 miles. For P inf.d = 1- (1 + E / β) ^ (- α) 2.00E^{-10}. For (P inf x P inf.d y = 365) was 7,29E-10 while for (Pill = P inf.y x S x I = 1.12E-5.Bahwa (Pinf.d or Pill) ketch more than 10-6 ie examples of the highest concentrations of bacteria are Pinf.yx S x I = 13.3771209E-1 is a high risk. Of the 15 samples of water in the village Puty with test results analysis P inf.y x S x I all smaller than 10-6 then all categorized as high risk.

Discussion

Results of the analysis of the content of total coliform bacteria in water samples dug research region ranged 130-160000000 MPN / 100 ml indicates that the water has been contaminated by human or animal feces that can cause gastrointestinal diseases. All samples were above the threshold of water quality standards are allowed to water intended for drinking water which should not be any bacteria that is 0/100 ml of water and for its designation as clean water ≤50 MPN / 100 ml. This study shows that the number concentration of E. Coly between 23-24.000.000 ranges coli cells / 100 ml water. In 100 ml drinking water should not be on the content of the bacterium Escherichia coli. The presence of E. coli in drinking water indicates poor water quality. Bacteria indicator bacteria E. coli are sanitation and also be pathogen that frequently causes various diseases[6].

In this study of the results of the risk analysis of the sample greatest risk is 12,82016452E^{-1} with a concentration of 23 million cells of E. coli / 100 ml of water is on the sample 4 and sample 5 is 13,3771209E^{-1} with concentration E. coli bacteria in the water 23 million cells / 100 ml of water. This is a relatively high risk even as the highest mortality burden in the future. The high concentration of bacteria in the water as probable with the results of measurements of water temperature past the normal limit water quality standard yaitu31,6 ie on the samples 2 to 15 and 30.9 on the sample 6, and to 3 on the sample 5 is the maximum allowed 30.1 (BMA) water quality standards (26-29^{0}C but total coliforms are found under the maximum limit. It shows that the temperature conditions conducive to the growth of total coliforms. It is possible there are other factors such as levels of waste, as well as other things that cause could grow maximum of coliforms in the water[7].

Risk characteristics that (P inf/day or P ill) ketch more than 10-6 is an example of the highest concentrations of bacteria are P inf/year x S x I = 13.3771209E-1 is a high risk. Of the 15 water samples with assay results of analysis P inf/y x S x I all smaller than 10-6 then all risks are categorized high. A study previously done by Kroli[8], shows that the level of risk is lower (1.36E^{-07} for fig. 1 and 1.45E^{-07}) showed that cater to the health-based targets. Taking the average contamination in the distribution, the risk is much higher (5.26E^{-04} for 1998 and 2.92 E^{-04} for 1999). Gastrointestinal infections arising as a result of this attack Escherichia coli bacteria to the intestinal wall causing movement of the solution in large quantities and damage the membrane electrolyte balance in mucus. It can cause water absorption in the intestinal wall decreases and causes diarrhea[9-13].

Conclusions

Probability Risks of infection (P inf/d) from Escherichia coli bacteria contamination in drinking water of 15 samples were highest in samples 5 was 2.40 E^{-4}. Then, probability of infection / year (P inf / year) 1.34E^{+1} or the probability of illness (Pill) is the category in the high risks 1.34E^{+1}.

Ethical Clearance- Taken from Faculty of Public Health committee

Source of Funding- Self

Conflict of Interest – Nil

References

1. Suriawiria *et al*. *Mikrobiologi air*. Bandung: PT Alumni. 2008.
2. Kementerian Kesehatan No. 492/MENKES/PER/ IV/2010 *Tentang Persyaratan Kualitas Air Minum.*

Kementerian Kesehatan Republik Indonesia : Jakarta. 2010.

3. Natsir *et al.* Analisis Kandungan MPN Coliform Fecal Pada Sumur Galian Dan Sumur Bor Di Rt 01 Desa Batu Merah Kecamatan Sirimau Kota Ambon. Jurnal Fikratuna Volume 6, Nomor 1, Januari-Juni 2014
4. WHO. *Who Guidelines For Safe Recreational Water Environments*, 2009; Volume 1, Coastal And Fresh Waters.
5. Hunter. *Risk Assessment Guideline Microbial. 2002*
6. Ingun. *On-Line Monitoring of Escherichia coliin Raw Water at Oset Drinking Water Treatment Plant, Oslo (Norway)* International Journal of Environmental Research and Public Health ISSN 2015; 1660-4601
7. Aude. *Microbial Contamination Detection in Water Resources: Interest of Current Optical Methods, Trends and Needs in the Context of Climate* : Change international Journal of environmental Research and Public Health. 2014; ISSN 1660-4601;
8. Kroli J.*et al.Microbial source tracking and spatial analysis of E. coli contaminated private water wells in south eastern Ontario*. Journal Water Health, 2014; 12(2):348-57.
9. Mallongi, A. and Herawaty, 2015. Assessment of Mercury Accumulation in Dry Deposition, Surface Soil and Rice Grain in Luwuk Gold Mine, Central Sulawesi. Res. J. Appl. Sci., 10: 22-24.
10. Ristya Widi Endah Yani, Anwar Mallongi, Sri Andarini, Dwi Prijatmoko, Ida Ratna Dewanti. 2016. The Effect of Zinc Saliva on the Toddlers' Nutritional Status, J Int Dent Med Res 2016; 9: (1), Pp.29-32
11. Sumbangan Baja, Nurmiaty & Samsu Arif., GIS-Based Soil Erosion Modeling for Assessing Land Suitability in the Urban Watershed of Tallo River, South Sulawesi, Indonesia. Modern Applied Science; 2014. Vol. 8, No. 4. URL: ttp://dx.doi.org/10.5539/mas.v8n4p50
12. Khomariyatika T & Sarah. *Kualitas Bakteriologis Air Sumur Gali*.Jurnal Kesehatan Masyarakat,Kesmas 2011; 7(1) 63-72
13. Anwar Mallongi, Anwar Daud, Hasanuddin Ishak, Ruslan La Ane, Agus Bintara Birawida, Erniwati Ibrahim, Makmur Selomo and Stang Abdul Rahman. 2017., Clean Water Treatment Technology with an Up-flow Slow Sand Filtration System from a Well Water Source in the Tallo District of Makassar. J. Environ. Sci. Technol., 10: 44-48.

ANWAR_MALLONGI__Issued_Papers.pdf

ORIGINALITY REPORT

%6	%2	%3	%2
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Holger R. Maier, Angus R. Simpson, Aaron C. Zecchin, Wai Kuan Foong, Kuang Yeow Phang, Hsin Yeow Seah, Chan Lim Tan. "Ant Colony Optimization for Design of Water Distribution Systems", Journal of Water Resources Planning and Management, 2003 Publication	%1
2	www.who.int Internet Source	%1
3	pt.scribd.com Internet Source	%1
4	Submitted to Universitas Diponegoro Student Paper	<%1
5	S. Notermans, P. Teunis. "Quantitative risk analysis and the production of microbiologically safe food: an introduction", International Journal of Food Microbiology, 1996 Publication	<%1
6	Submitted to Georgia College & State University Student Paper	<%1

7	Noer Bahry Noor, Anwar Daud, Munawir Amansyah, Anwar Mallongi. "Affectivity Dose of Acorus calamus (Sweet Flag) to Reduce the Ammonia in Hospital Wastewater", Journal of Environmental Science and Technology, 2017 Publication	<%1
8	Submitted to Universitas Hasanuddin Student Paper	<%1
9	Anwar Mallongi, Muhammad Nadjib Bustan, Nur Juliana, Herawati. "Risks Assessment due to the Exposure of Copper and Nitrogen Dioxide in the Goldsmith in Malimongan Makassar", Journal of Physics: Conference Series, 2018 Publication	<%1
10	"20th International Congress of Nutrition: Granada, Spain, September 15 20, 2013", Annals of Nutrition and Metabolism, 2013 Publication	<%1
11	repository.unhas.ac.id Internet Source	<%1
12	ijshr.com Internet Source	<%1
13	Jack F. Schijven, Ana Maria de Roda Husman. "Chapter 24 Applications of Quantitative Microbial Source Tracking (QMST) and Quantitative Microbial Risk Assessment	<%1

(QMRA)", Springer Nature, 2011
Publication

EXCLUDE QUOTES	ON	EXCLUDE MATCHES	< 5 WORDS
EXCLUDE BIBLIOGRAPHY	ON		