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Analysis of Drinking Water Quality Directly Related to Health at Refill Depots in the South Bekasi Area, Indonesia

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Abstract. Water is a source of life for living things for daily needs. The dense population and limited water sources result in an increase in drinking water that is suitable for consumption. It has encouraged many people to look for alternative sources of drinking water, one of which consumes drinking water from refill depots. The research aims to analyze microbiological and inorganic chemical parameters in several drinking water sources from water depots in the South Bekasi area, Indonesia. Microbiological analysis of drinking water was carried out by identifying types of germs and inorganic chemical analysis using a spectrophotometer. Based on the study's results, three samples of drinking water were detected containing E.coli bacteria, and five samples of drinking water containing Pseudomonas sp. Inorganic chemical analysis shows that all samples contain inorganic chemical compounds (Ar, F, Cr, Cd, NO2, NO3, CN, Se) with concentrations below the maximum levels allowed by Minister of Health Regulation Indonesia.

Keywords. Drinking water, refill depots, Escherichia coli, inorganic chemistry

Introduction

Water is a natural resource that plays an important role in the life of living things; as much as 70% of the earth's surface is covered with water. Humans, as living beings, need water for their survival because two-thirds of the human body consists of water. [1] The water that humans need for their daily needs is water that is suitable for consumption. Humans' drinking water is limited, but the water used can be processed again into water suitable for consumption to meet human needs. [2]

Adequate water for consumption is water that is clean, healthy, and meets water quality based on the parameters of the Decree of the Minister of Health of the Republic of Indonesia Number 492/MENKES/PER/IV/2010, Article 3 paragraph (1) states that: "Drinking water is safe for health if it meets the physical, microbiological, chemical and radioactive requirements contained in the mandatory parameters and additional parameters" [2]

Sources of drinking water that are unhealthy and unsuitable for consumption determine the condition of public health because they can cause various diseases. The average number of sufferers of waterborne diseases is increasing every year. Waterborne diseases are diseases that are transmitted through water. Where drinking water contains disease germs or toxic chemicals,

based on data from the Directorate of Environmental Technology, it is known that one of the waterborne diseases many people suffer from is diarrhea in 177,506 patients due to microbiological contaminants in drinking water. [3; 4] Drinking safe water for consumption must be free from contamination by *Escherichia coli* bacteria. In every 100 mL of drinking water sample examined should not contain Coliform. [5] Diarrhea (gastroenteritis) is still a major public health problem in Indonesia. According to the Ministry of Health, in 2018, there were an estimated 4,504,524 cases of diarrhea sufferers of all ages in Indonesia. [6] Data from the Bekasi City Health Office in 2018 showed that the number of diarrhea cases of all ages was 22,530.

The need for drinking water in urban areas continues to increase along with population growth and population density. So, people are encouraged to look for alternative drinking water suitable for consumption, such as bottled drinking water. Because it is considered more practical and hygienic, apart from bottled drinking water, the community's alternative drinking water is water obtained from refilled drinking water depots. Refilled drinking water depots is industrial raw water processed into drinking water and sold directly to consumers. Refill drinking water depots continue to increase in line with the community's need for good quality water and safe for consumption. Even though it is cheaper, not all refilled drinking water depots are guaranteed product safety. [3]

Drinking water depots spread across the South Bekasi area in 2014 had samples examined from drinking water providers. The results obtained in the examination, which is around 72.37%, are safe for consumption. The rampant circulation of depot water and the low level of internal supervision (supervision by Depot entrepreneurs) prompted the government to propose in 2015 to conduct a study on the importance of monitoring drinking water by drinking water providers. [3] Based on this, this study aims to assess and analyze drinking water quality directly related to health at refill depots in the South Bekasi area.

The research was conducted to determine the quality of drinking water at refill drinking water depots in the South Bekasi area based on parameters directly related to health, namely microbiological parameters and inorganic chemical parameters, according to the 2010 Minister of Health Regulation. The research is expected to provide information and an overview to the public about drinking water quality at several refill depots in the South Bekasi area.

Literature Review

Water is an element that has an important role in the life of every creature that lives on this earth. Scientifically, water can be interpreted as a chemical compound consisting of two elements, namely the element H_2 (hydrogen), which binds to the element O_2 (oxygen), which then produces the compound water (H_2O). The role of water in life is very large because water is the source of life. Sources of clean water can come from surface water because surface water is river water that flows from the mountains, looks clear, and has no smell. Physically clear and clean water is used by humans for household needs, for example, for bathing and washing clothes. Industrial needs, for example, for factories and power plant buildings. While, clean water that meets health standards and is safe for consumption is drinking water that has gone through a processing process and meets health requirements so that it can be drunk directly. [8] Sources of drinking water can come from springs in volcanic mountains because volcanic mountains contain mineral content that is rich in oxygen, so it is safer for consumption. [9] The source of drinking water in Indonesia is usually PAM water (Drinking Water Company). PAM water comes from river water treated to remove or kill harmful bacteria. [10] Drinking water has many benefits for the human body, including improving human blood circulation; blood

will become thicker if our body lacks fluids, and blood viscosity will affect the performance of the brain and heart. As a poison detoxification process, water can remove toxins through sweat, urine, and breathing. Maintain moisture and skin elasticity from external influences. As a process of transporting nutrients and oxygen in the blood from the intestines to the body's cells. As a lubricant for joints and muscles, water plays a role in replacing body fluids wasted due to certain diseases. [11]

According to the Minister of Health Regulation, Indonesia and the Food and Drug Supervisory Agency (BPOM), water suitable for consumption can be measured by two parameters, namely parameters related to health and parameters that are not related to health [12]. The requirements for water suitable for consumption can be seen in Table 1.

Table 1. Requirements for drinking water quality according to the Regulation of the Minister of Health, Indonesia [10; 12]

No.	Parameter Type	Unit	Maximum Rate
1.	Directly related parameters with health		
	a. Microbiology		
	- *E.coli*	Amount per 100 ml sample	0
	- Total coliform bacteria	Amount per 100 ml sample	0
	b. Inorganic chemistry		
	- Arsenic	Mg/l	0,01
	- Fluoride	Mg/l	1,5
	- Total Chromium	Mg/l	0,05
	- Cadmium	Mg/l	0,003
	- Nitrite (NO_2)	Mg/l	3
	- Nitrate (NO_3)	Mg/l	50
	- Cyanide	Mg/l	0,07
	- Selenium	Mg/l	0,01
2.	Parameters that are not directly related to health		
	a. Physics		
	- Smell		No smell
	- Color	TCU	15
	- Total dissolved solids (TDS)	Mg/l	500
	- Turbidity	NTU	5
	- Taste		Tasteless
	- Temperature	°C	Air temperature ±3
	b. Chemical		
	- Aluminum	Mg/l	0,2
	- Iron	Mg/l	0,3
	- Hardness	Mg/l	500
	- Chloride	Mg/l	250
	- Manganese	Mg/l	0,4
	- pH	Mg/l	6,5-8,5

Note: Maximum levels according to Minister of Health Regulation, Indonesia

Chemical compounds are divided into 2, namely organic chemistry and inorganic chemistry. Organic chemistry is an organic compound obtained from living things such as plants and animals as a source, while inorganic chemistry is a compound produced from minerals. Inorganic chemical parameters are one of the most important in determining water quality

because toxic and hazardous chemicals can interfere with health. While chemical parameters, which include organic and inorganic compounds, such as aluminum, iron, hardness, chloride, manganese, and pH, determine the drinking water quality that is not directly related to health. Inorganic chemical compounds that are usually used as parameters in determining the quality of drinking water that is directly related to health are arsenic, fluoride, total chromium, cadmium, nitrite, nitrate, cyanide, and selenium. [13]

Arsenic compounds are produced from within the earth's crust. Arsenic used for mining or industrial needs is called arsenic poison because it can contaminate water, air, and food. Symptoms of someone poisoned by arsenic drinking water are dark urine, shortness of breath, and dehydration, and they can cause complications such as heart disease and cancer. [14] Fluoride is one of the ions that is known to be useful in preventing dental caries when used at a concentration of less than 1.5 mg/l, but it also has a negative effect, namely causing fluorosis of the teeth, namely the teeth become spots if the concentration is greater than 1.5-2 mg/l. One source of fluoride intake is from the water consumed. [15] Chromium is a mineral the body needs for insulin production to stabilize blood sugar levels. But if the chromium level exceeds the maximum limit of 0.05 mg/l, it can cause a decreased immune system, nausea, and vomiting. On contact with the skin, chromium can cause skin rashes. [16] Cadmium can be produced from the extraction of lead from zinc. A slightly acidic pH causes a high concentration of cadmium in water and is corrosive, so cadmium can poison the body and cause permanent damage to the nervous system (minimata disease). [17] Nitrite compounds (NO_2) are derived from ammonia and nitrogen, which aerobic bacteria oxidize. First, ammonium can be converted to nitrite (NO2), then nitrite is converted to nitrate (NO_3). Nitrite can oxidize hemoglobin to methemoglobin because Fe^{2+} is converted to Fe^{3+}, so blood cannot carry oxygen. Nitrites that form nitrosamines can cause cancer because nitrosamines are known carcinogens. [18] Nitrate compounds in drinking water in amounts that exceed the maximum level can cause methemoglobinemia (blue baby syndrome). [19] Cyanide compounds contain carbon-nitrogen (CN) bonds. Cyanide can be toxic if it exceeds the maximum level of 0.07 mg/l. Cyanide poison prevents the body's cells from using oxygen to produce energy molecules. Without oxygen, mitochondrial cells cannot produce energy in the form of ATP, so tissues such as heart muscle cells and nerve cells can be deficient in ATP and cause chronic effects on the central nervous system. A characteristic symptom when heart muscle cells and nerve cells lack ATP is a blue color of the skin (cyanosis syndrome). Selenium is a mineral that the body needs; the maximum level of selenium in the body is 0.01 mg/l; if it exceeds the maximum level, it will result in selenium poisoning or selenosis. Symptoms of selenosis are a garlic odor on the breath, indigestion, hair loss, flaking nails, fatigue, irritability, and nerve damage. Extreme cases of selenosis can lead to liver cirrhosis, pulmonary edema, and death. [20]

Based on the results of observations and bacteriological laboratory tests for the presence of Coliform using the most probable number (MPN) method according to the standards of the Minister of Health of the Republic of Indonesia Number: 492/MENKES/PER/IV/2010 concerning drinking water quality requirements, states that in every 100 mL sample, The drinking water that is inspected cannot contain Coliform, meaning that the drinking water meets the requirements for potable water. [21] Enterobacteriaceae (coliform) is a group of Gram-negative bacteria in the form of bacilli or rods and has a predilection for Enterobacteriaceae in the intestinal system of humans and animals. The Enterobacteriaceae family includes Escherichia, Shigella, Salmonella, Enterobacter, Klebsiella, and Serratia. *Escherichia coli* is a normal flora that can become a pathogen in the intestinal system. [6] *Escherichia coli* is a member of the Enterobacteriaceae family in the form of short rods (coccobacilli) to round

(coccus), with cell lengths between 2.0-6.0 µm and cell widths between 1.1-1.5 µm. *E.coli* cells exist in single, paired, non-encapsulated forms. Usually, these cells move with petrichous flagella and are aerobic or facultative aerobic (bacteria that can use oxygen but produce energy without oxygen). Good growth of *E.coli* is at an optimal temperature of 37°C. *E.coli* can ferment glucose, lactose, and saccharose and produce a negative test on H_2S. *E.coli* has a distinctive morphology on Eosin Methylene Blue (EMB) agar media which can show a metallic sheen color; inhibiting Gram-positive bacteria growth. [6]

One of the diseases that *E.coli* often causes is diarrhea; diarrhea is a disease characterized by an increase in the frequency of defecation more than usual (> three days) accompanied by a change in the consistency of the stool (to become liquid), with or without blood and mucus. [22] Based on Basic Health Research in 2007, the most common cause of infant death was diarrhea (31.4%), and for children under five years, as much as 25.2%. While the results of the Household Health Survey in 2003, every child in Indonesia experienced of diarrhea as much as 1.6-2 times per year. [23]

Based on the time, diarrhea is divided into 2, namely acute diarrhea and chronic diarrhea (persistent diarrhea). Acute diarrhea occurs suddenly in infants and children who were previously healthy; acute diarrhea lasts for less than 14 days. Microorganisms that cause acute diarrhea can be seen in Table 2. Meanwhile, chronic diarrhea continues for up to 2 weeks or more, with weight loss during the diarrhea period. Acute diarrhea is caused due to infection by the entry of microorganisms through the mouth. These microorganisms can pass through water, food, or drink contaminated with human or animal feces and go through the fingers or hands of patients whom microorganisms have contaminated.

Table 2. Microorganisms that cause acute diarrhea [17]

Virus	Bacteria	Protozoa
Rotavirus	Escherichia coli	Giardia lamblia
Norwalk virus	Salmonella	Entamoeba histolytica
Enteric adenovirus	Staphylococcus aureus	Cryptosporidium
Calicivirus	Shigella	
Astrovirus	Vibrio cholerae	
Coronavirus	Bacillus cereus	
Cytomegalovirus	Staphylococcus aureus	

A part from infection by microorganisms, diarrhea can also be caused by several things such as food allergies, malabsorption of carbohydrates (lactose intolerance), fats and proteins, food poisoning by canned food due *to Botulinum sp*, and drugs. Meanwhile, chronic diarrhea can be identified by asking the patient to fast for one day to determine if diarrhea they are suffering is classified as osmotic diarrhea or secretory diarrhea. Osmotic diarrhea is caused by food ingredients that cannot be absorbed, resulting in increased osmolarity in the intestinal cavity so that water and electrolytes are attracted to the intestinal cavity from the plasma, and diarrhea occurs. Examples of osmotic diarrhea, such as food intolerance and osmotic diarrhea, can be enforced if the stool osmotic gap is > 125 mosmol/kg (normal <50 mosmol/kg). How to calculate the osmotic gap employing serum osmolarity (290 mmol/kg)-[2 x (sodium concentration) + fecal potassium)]. Meanwhile, secretory diarrhea is caused by excess secretion or decreased absorption due to impaired electrolyte transport, so diarrhea sufferers experience dehydration. Classification of diarrhea based on the degree of dehydration can be seen in Table 3. Bacterial toxins and the intestinal mucosal disease usually cause secretory diarrhea. Clinical

manifestations of secretory diarrhea are loose, copious, painless stools and no mucosa or blood. [24]

Table 3. Classification of diarrhea based on the degree of dehydration [24]

Classification	Signs and symptoms
Severe dehydration (Fluid loss >10% body weight)	Two or more of the following signs: -Weak condition, lethargy / unconscious -Large fontanel, very sunken eyes -Lazy to drink / unable to drink -The pinch of the stomach returns very slowly (>=2 seconds)
Mild to moderate dehydration (Fluid loss <5% body weight)	Two or more of the following signs: -Fussy, restless, whiny -Large fontanel, slightly sunken eyes -Looks thirsty and can drink -The pinch of the stomach returns slowly
No dehydration	There is no sign of being classified according to the two criteria above.

Drinking water depots are industrial businesses that process raw water into drinking water and sell it directly to consumers. Based on the Decree of the Minister of Industry and Trade of the Republic of Indonesia Number: 651/MPP/Kep/l0/2004 Chapter II, Article 2 regarding business requirements, says that "Drinking water depots are required to have a report on the results of drinking water tests produced from a water quality inspection laboratory appointed by the Government. District/City or accredited" drinking water quality tested includes physical, chemical and bacteriological parameters aimed at ensuring the quality of the drinking water product produced. The results of laboratory tests for potable water quality must be posted at the refill drinking water depot so that consumers can know them. [25]

The equipment for refilling drinking water depots includes pumps, cartridges, filters, ultraviolet rays, ozonizer devices and revert osmosis. The pump is used to suck up water from the tank. Cartridge made of tube and filled with 0.5-micron gauze; 0.3 microns; and 1 micron serves to inhibit small impurities. The filter is made of paralon, and it takes three filters containing silica; filter one is added with zeolite sand, filter two is filled with activated carbon, and filter three is filled with activated sand.

Silica in the filter improves filtering, while zeolite absorbs heavy metals and ammonia, the activated carbon absorbs odors and colors, and active sand is used as a water separator for iron and manganese. Ultraviolet light in the drinking water depot device kills germs in the water. Ozonizer device, Revert Osmosis, is an additional device that functions as an ozonizer, namely converting oxygen contained in water into ozone, while recert osmosis is a tool that can neutralize water from pollutants. To maintain drinking water quality, clean the filter and cartridge regularly, which is six months to once a year. [26]

Research Method

The research carried out is experimental to determine the quality of drinking water at a refill depot in South Bekasi-Indonesia, employing the identification of germs and inorganic chemical laboratory tests. The location of research was carried out at the UKI FK Microbiology Laboratory and the DKI-Jakarta Basic Health Laboratory. The research was conducted from September to October 2019. The research sample was obtained by random sampling, namely collecting eight refilled drinking water depots in the South Bekasi area for two parameters, microbiological parameters, and inorganic chemical parameters. The tools used in the research

included glass tools, handscoons, masks, tissues, small containers, carbon, sterile pots, permanent markers, autoclaves, rubber, balances, cotton, asbestos gloves, gas stoves, test tube racks, durham tube, incubator, 15 cm petri dish, round loop, needle loop, match, bunsen, syringe, object glass, light microscope 100x objective-10 ocular, dropper pipette. At the same time, the materials used in the study included refill drinking water samples, thioglycolate, distilled water, Eosin-Methylene-Blue (EMB) media, triple sugar iron agar (TSIA), glucose, lactose, saccharose, semisolid agar, citrate, physiological NaCl, purple crystal carbolic acid, lugol/iodine, 96% alcohol, fuxin water, xylol, immersion oil. The working procedures are a) sample preparation, b) microbiological analysis parameters, and c) inorganic chemical test.

Result and Discussion

Microbiological analysis is one of the analyzes to determine the presence of microorganisms in the drinking water samples studied. The bacteria to be detected in the research sample are *E.coli* and *Pseudomonas sp*. The analysis results of the detection of microorganisms in refill drinking water samples can be seen in Table 1.

Table 4. Results of analysis of detection of *E.coli* and *Pseudomonas sp*. on drinking water samples from refill depots

Sample	Identification	
	Escherichia coli	*Pseudomonas sp.*
1	-	+
2	-	+
3	-	+
4	+	-
5	+	-
6	-	+
7	-	+
8	+	-

The result is (+): Detected germs in the tested sample
(-) : No germs were detected in the tested sample

Based on Table 1, it is known that *E.coli* bacteria were detected in drinking water samples from refill depots number 4, 5, and 8. Meanwhile, *Pseudomonas sp*. was detected in drinking water samples originating from refill depots 1, 2, 3, 6, and 7.

Inorganic chemical analysis in this study aims to determine the levels of inorganic chemical compounds in the research samples. The inorganic chemical analysis includes arsenic, fluoride, total chromium, cadmium, nitrites, nitrates, cyanide, and selenium. The results of inorganic chemical analysis on drinking water samples from refill depots can be seen in Table 5.

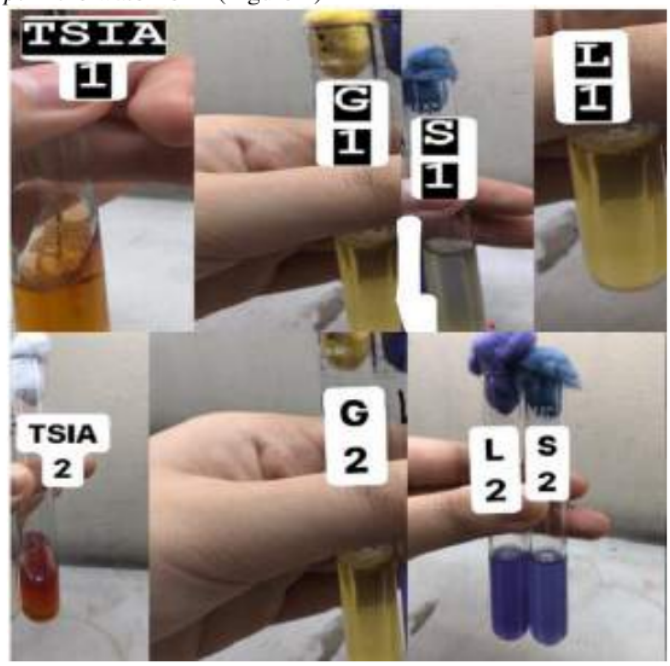
Table 5. Results of the analysis of the content of inorganic chemical compounds in drinking water from the refill depot in the South Bekasi area

Analysis	Sample								Max rate
	1	2	3	4	5	6	7	8	
Arsenic	0,0021	0,0024	0,0021	0,0040	0,0027	0,0019	0,0021	0,0031	0,01
Fluoride	0,03	0,05	0,03	0,05	0,17	0,03	0,03	0,25	1,5
Total Chromium	0,0004	0,0005	0,0004	0,0006	0,0013	0,0006	0,0004	0,0011	0,05
Cadmium	0,0003	0,0003	0,0003	0,0006	0,0003	0,0001	0,0003	0,0004	0,003

Nitrite	0,122	0,123	0,122	0,125	0,122	0,131	0,122	0,129	3,0
Nitrate	3,55	3,58	3,55	3,44	3,63	3,52	3,54	3,58	50
Cyanide	0,0015	0,0014	0,0015	0,0020	0,0021	0,0028	0,0018	0,0020	0,07
Selenium	0,0021	0,0024	0,0021	0,0030	0,0028	0,0022	0,0026	0,0030	0,01

Note: Maximum levels according to Minister of Health Regulation number 492 (2010)

Based on research on refill drinking water samples, apart from detecting *E. coli*, *Pseudomonas sp*. in the water refill (Figure 1)



Information: G (glucose), S (saccharose), L (lactose)

Figure 1. Biochemical tests for (1) *E.coli* and (2) *Pseudomonas sp*., such as TSIA media and sugar.

Microbiological analysis of drinking water from refill depots (Table 1) shows that three drinking water samples detected *E.coli* bacteria and four *Pseudomonas sp*. samples. *Pseudomonas sp*. in drinking water is not allowed because *Pseudomonas sp*. are pathogenic bacteria commonly found in faeces, feces, and soil; these bacteria can reproduce in water. The impact of drinking water contaminated with *Pseudomonas sp*. bacteria is causing respiratory system infections (pneumonia), urinary tract, gastrointestinal infections, and meningitis. [27] Based on these results, it is known that the drinking water sample used does not meet the bacteriological requirements listed in the Regulation of the Minister of Health of the Republic of Indonesia Number: 492/MENKES/PER/IV/2010 concerning drinking water quality requirements, stating that in 100 mL of water sample drink that is examined must not contain Coliform. [21] It can be seen that all samples of drinking water from refill depots tested are unfit for consumption. The research was carried out in line with the research of Dora (2013), which stated that out of 15 samples of drinking water refill depots in Rawalumbu Bekasi District-Indonesia, four samples (26.7%) of them were found positive for *E.coli* germs.

Meanwhile, out of a total of 15 samples of bottled drinking water, 1 sample (6.7%) was found positive for *E. coli*. [28] The same thing happened in a study conducted in the city of Makassar in 2011; as much as 68.97% of the causes of microbial contamination in refilled water at drinking water depots in the city of Makassar were caused by the hygiene of officers and employees who did not meet the requirements. [29]

Contamination by E.coli germs can come from sanitary conditions, operator cleanliness, quality of disinfection equipment, water packaging, water flow rate, and operator behavior. The dominant variables affecting microbial contamination in drinking water from refill depots are operator knowledge, operator sanitation, and hygiene.

Based on Table 2, it is known that all drinking water samples from the refill depot in the South Bekasi area contain arsenic, fluoride, total chromium, cadmium, nitrite, nitrate, cyanide, and selenium with limits below the maximum levels allowed by the government following the decree Regulation of the Minister of Health Indonesia number 492 (2010) regarding the quality of drinking water. If the inorganic chemical content of drinking water exceeds the maximum permissible level, the water from the refill depot does not meet drinking water standards and may not be marketed. [30]

In biochemistry, inorganic chemical compounds (minerals) are needed by the body in small amounts (micronutrients), but if these compounds are in water exceeding normal levels, they can cause various diseases, such as arsenic, when present in high concentrations in water. Drinking it can cause complications such as heart disease and cancer. High levels of fluoride in water can cause tooth decay (fluorosis). Chromium can cause a decreased immune system, nausea, and vomiting. Cadmium can poison the body and cause permanent damage to the nervous system (minimata disease). Nitrite compounds (NO_2) can oxidize hemoglobin to methemoglobin because Fe^{2+} is converted to Fe^{3+} so that blood cannot transport oxygen; nitrites that form nitrosamines can cause cancer because nitrosamines are known carcinogens. Nitrate compounds can cause methemoglobinemia (blue baby syndrome). Cyanide compounds can be toxic. Selenium will result in selenium poisoning or selenosis. Symptoms of selenosis are a garlic odor on the breath, indigestion, hair loss, flaking nails, fatigue, irritability, and nerve damage. Extreme cases of selenosis can lead to liver cirrhosis, pulmonary edema, and death. [31]

The research results conducted by Heruna (2011) used drinking water samples from Ciburia, Bogor-Indonesia, by carrying out two treatments, namely using a filtration process and not a filtration process. The study states that water that does not go through a filtration process has a higher content of inorganic chemicals (Cn, Pb, Mn, Cr, Cd) than water that goes through a filtration process. Water that does not pass through the filter has inorganic chemical compounds above the WHO standard threshold (Cd: 0.005-Cr: 0.05-Pb: 0.1-Mn: 0.1-Cn: 0.1). [32]

Conclusion

Based on the results of research on drinking water samples from refill depots in South Bekasi-Indonesia, it can be concluded that: a) 3 of 8 refill drinking water samples contained *E.coli* and 5 of 8 refill drinking water samples contained *Pseudomonas sp*.; and b) Meanwhile, in the analysis of inorganic chemical compounds, it was found that all research samples (Ar, F, Cr, Cd, NO_2, NO_3, CN, Se) had concentrations below the maximum levels allowed by Regulation of the Minister of Health of Indonesia number 492 (2010). Therefore, For future research, it is recommended that quantitative analysis be carried out to test the total number of coliform bacteria and detect other bacteria present in refill drinking water in a wider area to

determine the suitability level of drinking water in refill depots which are widely consumed and in demand by the public. And can provide counseling to refill drinking water depots regarding the requirements for potable water according to Regulation of the Minister of Health Indonesia.

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