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DETECTION Escherichia coli *IN DRINKING WATER SOURCES IN CHICKEN FARMING IN NARMADA DISTRICT, LOMBOK BARAT REGENCY*

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Abstrak

Air sangat berperan penting dalam kehidupan manusia. Salah satu sumber air yang dimanfaatkan oleh masyarakat adalah sumber air yang berasal dari sumur, Sumber air yang berada di wilayah peternakan ayam di Narmada tidak hanya dimanfaatkan untuk kebutuhan ternak tetapi dimanfaatkan dan dikonsumsi oleh masyarakat khususnya peternak di sekitar sumber air tersebut. Jarak antara sumber air dengan wilayah peternakan yang kurang dari 15 meter menjadi salah satu penyebab air dapat terkontaminasi limbah peternakan salah satunya kontaminasi dari feses. Penelitian ini bertujuan untuk mendeteksi adanya Eschericia coli pada sumber air minum di peternakan ayam kecamatan Narmada. Metode penelitian ini menggunakan metode survey dengan pendekatan cross sectional study yang dilaksanakan pada bulan September 2022. Sampel diambil menggunakan botol steril yang kemudian akan dikultur kedalam media agar EMBA, NA dan akan diuji biokimia. Hasil pengujian ini menunjukkan dari 10 sampel air sumur di wilayah peternakan terdapat 4 yang terdeteksi mengandung E.coli ditandai dengan terbentuknya koloni berwarna hijau metallic pada media EMBA dan pada pewarnaan didapatkan bentuk bakteri batang dan berwarna merah.

***Kata Kunci**: Eschericia coli, peternakan, sumber air*

Abstract

Water plays an important role in human life. One of the sources of water used by the community is a source of water that comes from wells. The water source in the poultry area in Narmada is not only used for livestock needs but is utilized and consumed by the community especially farmers around the water source. The distance between the water source and the poultry area is less then 15 meters which is the cause of contamination. Research the aimed to detect contaminating bacterial in water source in Poultry of Narmada Regency. The study used a survey method with cross sectional study approach which was carried out in September 2022. Sample were taken using sterile bottles which were then cultured in EMBA, NA and biochemical test. The result of this study showed that there were four samples contaminated with *E.coli* which was marked with a metallic green on EMBA and the show basil and red colors under microscope.

***Keywords**: Eschericia coli, Poultry, Water source*

1. INTRODUCTION

Water is one of the important natural resources for human life that cannot be

replaced by other compounds (Ariani et al., 2018). The need for clean water in Indonesia is increasing because the population growth in this region is fast and this has an impact on the level of clean water consumption (Keman, 2005). One of the sources of clean water consumed by people in Indonesia is from drilled wells/pumps and springs (Kemenkes RI, 2013). Bore/pump wells utilize groundwater which can be used to meet the needs of clean water which is usually used for daily needs, one of which is drinking water.The results of Sudarmadji's research (2007) state that groundwater is still the largest source of drinking water for residents, both in rural and urban areas, in which water is supplied in various ways. In Indonesia, various methods are used to obtain drinking water, both from groundwater, springs, rivers, and from other sources

In terms of quality, there are several requirements that must be met, including physical, chemical and biological qualities (Agustik et al., 2012). Physical quality consists of smell, color and taste. Chemical quality consists of pH. Biological quality, namely water free from pathogenic microorganisms such as Coliform bacteria, one of which is Echerichia coli. The presence of these bacteria indicates contamination of water sources (Kadek and Konsukartha, 2007). Groundwater contamination factors can be caused by the development and disposal of industrial waste, be it the livestock industry, metal processing or household industries (Mahyudin et al., 2015).

Industrial activities and human activities cause an increase in the number of contaminants in waters which result in water contamination (Mamun and Zainudin, 2013). The high yield of waste from industrial and domestic activities is not accompanied by an increase in waste management so that this can trigger pollution (Casali et al., 2010; Yudo, 2010). Pollution that occurs is usually related to a) first, namely the concentration of sediment originating from soil erosion, agricultural activities, mining, construction and other activities that involve exfoliating the soil layer; b) the second is related to organic waste originating from human domestic activities, livestock waste, animal and plant waste, and c) industrial activities related to the disposal of waste in the form of chemicals (Aina et al., 2016).

One of the most polluting water is waste disposal. Pollution due to waste can be in the form of solid waste and liquid waste. In the world of chicken farms, the waste that is often produced is in the form of feces which is directly on the ground in the area of the farm. Feces or livestock manure is a good medium for the development of microorganisms. Darmono (2001) states that contamination of groundwater or wells most often occurs due to contamination by microorganisms such as bacteria, viruses and parasites.

The body requires water to fulfill its metabolic demands and as a transport medium. Diarrhea, a sickness brought on by the presence of coliform bacteria in water, is one of the waterborne diseases that may be brought on by bacterial contamination in water. Dehydration that persists can be fatal (Winata and Hartantyo, 2013). The chosen water supply needs to be suitable for the area and the project. The water source to be used must take into account the distance from the water supply to the latrines, rubbish pits, waste pits, and other sources of polluting materials. Furthermore, it's important that the tools used be sanitized and resistant to contamination (Andrian dkk., 2014).

Based on the Regulation of the Minister of Health of the Republic of Indonesia No. 32 of 2017 states that the biological quality of water has a maximum total coliform bacteria in water of 50 cfu/100ml and a maximum of E.coli in water of 0 cfu/ml. Drinking water contaminated with E. coli can indicate that the water is contaminated with faeces, which can later

cause food poisoning if ingested or consumed (WHO, 2008). Escherchia coli (E.coli) is a type of faecal coliform bacteria and is a normal flora that is in the digestive tract, but can be found outside one of them in water because of contamination from faeces and can be pathogenic so that it can cause disease. Normally E. coli lives in the digestive tract so if it is found in a material, it is certain that the material is contaminated with microbes. E bacteria coli can be found in animal and human feces. Therefore, when a material is tested and the presence of bacteria is found, it needs further investigation.

According to Yustiani, et al (2017) the distance of the well which is less than 15 meters from the cage can result in contamination of well water with various microorganisms in the feces, the feces in the cage can enter the soil and follow the flow of groundwater which eventually enters the well, bacteria It can also be carried into drinking water sources when it rains. bacteria that can enter drinking water sources, one of which is Escherichia coli (E. coli).

Based on the results of preliminary interviews with farmers in Narmada District, West Lombok, the well water which is the source of water is groundwater which is drilled/dug to a depth of about 8 meters and channeled through pipes. This water will later be used as the main source of water on farms, for example for drinking water for animals and for cleaning cage equipment. Apart from being used for animal husbandry, it is also used for human consumption.Gunawan (2022) conducted research in Central Lombok on cattle farms the distance between the cage and the source of drinking water as far as 10 meters found that result source of drinking water positively polluted by Escherichia coli bacteria. Aprisansoni (2022) conducted the same research, namely to see if there was contamination of E. coli bacteria in a well in a chicken farm in West Lombok Regency, it turns out based on the results of his research obtained 4 out of 5 samples (80%) taken showed the results of well water used as a drinking water source were positively contaminated by bacteria *E. coli.*

2. RESEARCH METHOD

This research is a research using a survey method with a cross-sectional study approach which will be carried out in September 2022. Water samples were taken from water sources in several farms in the Narmada area, West Lombok.

Sampling and Laboratory Analysis

A total of 10 water samples were taken directly from water sources from wells sourced from groundwater around the farm. Samples were taken randomly from several farms. The samples were then tested at the Testing and Calibration Health Laboratory Center (BLKPK) of West Nusa Tenggara Province. The well water to be sampled is placed in a sterile tube of 200 ml which is then placed in an ice box to be taken to the laboratory.

The water sample was first homogenized by stirring, then 1 ml of the sample was diluted with 9 ml of sterile distilled water in the first tube, then homogenized by shaking. The sample in the first tube was taken 1 ml and diluted again with 9 ml of sterile distilled water in the second tube then homogenized then from the second tube the sample was taken 1 ml for dilution in the third tube in the same

way as in the first and second tube dilution, then from the third tube sample Diluted again in the fourth dilution tube in the same way as in the first, second, and third tube dilutions. In the fourth dilution tube, 0.1 ml of inoculum was added and dripped into the EMBA media. After that, it was incubated for 24 hours at 37ºC. On EMBA media, the colonies were observed. if there are bacterial colonies, the culture will be continued on NA slant (Nutrient Agar Slant) media. Colonies grown on nutrient agar are grown), then incubated for 24 hours. Bacteria that grow will be stained with Gram stain and characterized by Biochemical tests consisting of Indole Motility (SIM), Methyl Red (MR), Voges Proskauer (VP), Triple Sugar Iron Agar (TSIA), simmon citrate, urease, and Sulfit tests. fermented carbohydrates (confectionery). The tubes were then incubated in an incubator at 37℃ for 1x24 hours. Positive E. coli if the biochemical test results show indole (+), motility (+), MR (+), VP (-), Simmon citrate (-), urease (-), H2S (-), gas (+) indole (+), glucose (+), lactose (+), sucrose (±), maltose (+), and mannitol (+). Then analyzed based on Bergey's manual of determinative bacteriology (Holt et al, 1994).

3. RESULTS AND DISCUSSION

Based on the results of an analysis conducted in the laboratory on well water from water sources on farms, the results are as shown in Table 1.

Table 1. Results of bacterial examination found in water samples

Sample	Coliform bacteria growth
Well 1	+
Well 2	-
Well 3	-
Well 4	+
Well 5	-
Well 6	+
Well 7	+
Well 8	-
Well 9	-
Well 10	-

Description: + indicates the presence of bacterial growth.

In Table 1 it was found that out of 10 water samples, 4 contained coliform bacteria. Furthermore, the 4 positive initial samples will be continued on EMBA media which is a selective medium and the results are presented in Table 2.

Table 2. Results of implanting samples on EMBA media

Sample	EMBA
Well 1	Metallic Green Colonies, medium round colonies
Well 2	-
Well 3	-
Well 4	Metallic Green Colonies, medium round colonies
Well 5	-
Well 6	Metallic Green Colonies, medium round colonies
Well 7	Metallic Green Colonies, medium round colonies
Well 8	-
Well 9	-
Well 10	-

Based on Table 2, after culturing the Eosin Methylene Blue Agar (EMBA) media from ten samples, 4 samples were positive for E.coli. Changes in the EMBA media showed changes in metallic green colonies, as shown in Figure 1, while in Figure 2 it was found that there was growth of bacteria other than E.coli. EMBA media is a selective medium that shows bacteria are able to ferment lactose to form colonies that are

metallic green in color. Whereas on the EMBA media in the negative samples there was growth of bacteria other than E.coli bacteria which obtained were white, curly, and large round.

Then the results on the EMBA media showed a metallic green color change in the bacterial colonies followed by culturing the colonies using Nutrien Agar (NA) media and incubated for 24 hours at 37oC. NA media was used as a fertilizing medium with the aim that bacteria isolated from EMBA showing discoloration were taken and then scratched onto the surface of the NA media. This was intended so that bacteria could develop and only bacteria suspected of E.coli could be inoculated to proceed with staining and biochemical tests. NA media can be seen in Figure 3.

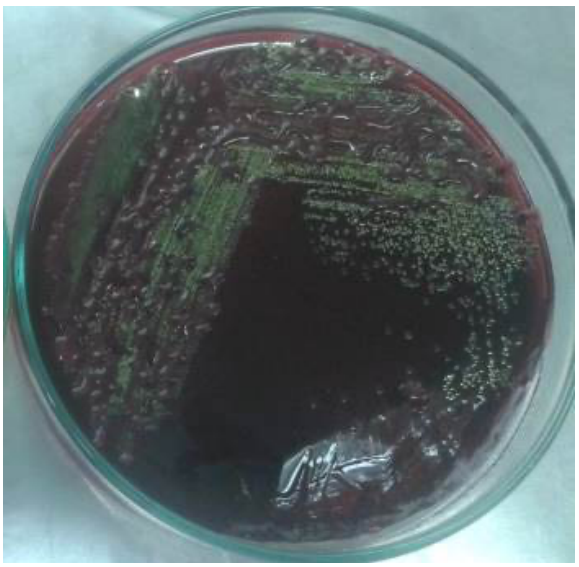
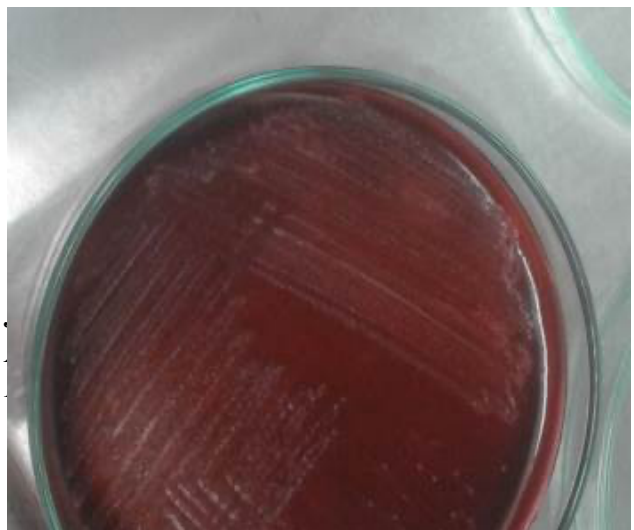
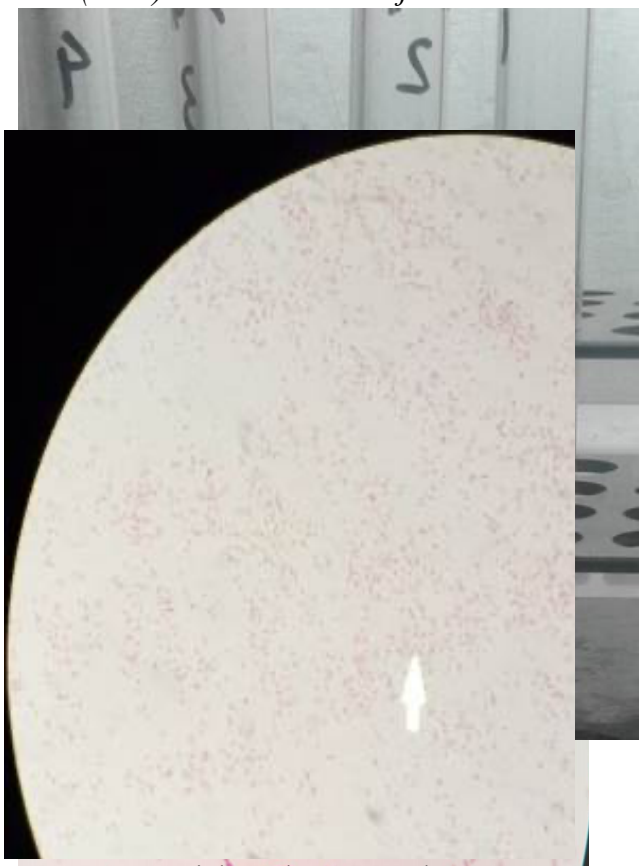


Figure 1. Metallic green colonies on EMBA media.

Figure 2. The EMBA media is not overgrown with E.coli bacteria





Bacterial culture results on NA media which have been incubated for 24 hours will be followed by staining and biochemical tests. Staining was carried out to determine the morphological form of the bacteria that had grown in agar media by applying a dye to the bacterial streaks on a glass object which can be seen in Figure 4. In this study, the results obtained showed the morphological form of the bacteria in the form of short red bacilli after being observed below. Microscopy, this is due to the concentration of lipids and the thickness of the peptidoglycan layer on the bacterial cell wall. As shown in Figure 5. In Figure 5, observations were made using a microscope with a magnification of 400X. The red color indicates the bacteria absorb the given dye.

Figure 4. Bacterial Staining Stages.

Figure 5. Staining results and observations under a microscope (100x)

Figure 6. Staining results and observations under a microscope (400x)

After staining, the bacteria growing on NA were followed by biochemical tests as shown in Table 2. The test results stated that these 4 samples were positive for E.coli.

Table 2. Biochemical Test Results

Sample	Biochemical Test							
	I	SC	u	L	G	M	Man	SIM
Well 1	+	-	-	+	+	+	+	+
Well 4	+	-	-	+	+	+	+	+
Well 6	+	-	-	+	+	+	+	+
Well 7	+	-	-	+	+	+	+	+

Description: I =indole, motility (+), SC=simmon citrate, U=urease, G=glucose, L=lactose, M=maltose, and Man=mannitol (+).

The results of the indole test on the sample indicated the formation of indole. This aims to identify the ability of bacteria to produce indole using enzymes *tryptophanase* which is oxidized and results in the formation of some bacteria which results in the formation of indole, pyruvic acid, ammonia (Hemraj, 2013). In this study, four samples tested for indole showed positive results as indicated by the formation

of a red ring on the media. This is because indole reacts with aldehydes.

Simmon citrate test aims to detect the ability of bacteria to utilize carbon sources as energy. If the bacteria can using citrate as a source the carbon will raise the pH and change the color of the culture medium from green turn blue. Observation results for the test citrate is negative on E.coli which means no change color on citrate test media (Jawet et al., 2008).

A sugar test on four shows that *Escherichia coli can ferment* lactose, glucose, and saccharose as well produce hydrogen sulfide (H2S). The thing it is indicated by a change in color from red to yellow, as well as presence bubbles on sugar media (Geo et al., 2011). Based on the results obtained and referred to Bergey's *manual of determinative bacteriology*(Holt et al, 1994) E. coli-positive bacteria samples.

The detection of E.coli in samples of well water in a chicken farm in the Narmada area indicates that the well water which is a source of water which is also used for human needs is contaminated. The source of this contamination can be obtained from the presence of contaminants, one of which comes from faeces (WHO, 2008).

Based on survey results of drinking water sources on farms which is used for drinking water for chickens, is used by breeders as well as by breeders as drinking water for breeders and is used for daily life. The water on this farm comes from dug wells which means using groundwater, the distance between dug wells and farms is not more than 10 km with a depth of 8 meters. The close distance between the chicken coop and a close water source has made the bacteria that in the cage contaminating the water source. A similar study was also conducted on farms in the Central Lombok region which detected E.coli bacterial contamination (Gunawan et al., 2022).

The distance between a good water source is at least 15 meters and the cage so as to minimize direct contamination between water and feces. Feces in the cage can enters the ground and follows the flow of groundwater which eventually enters the well, bacteria It can also be carried into drinking water sources when it rains. bacteria that can enter drinking water sources, one of which is Escherichia coli (E. coli) (Yustiani et al., 2017).

The water source on this farm is a source of water that is not only used for livestock but also used as a source of water for the lives of breeders. The presence of E. coli bacteria contamination in water sources can have a major impact because these bacteria can cause health problems, reduce the quality of a food ingredient and reduce product quality (BSNI, 2009).

Republic of Indonesia Government Regulation No. 82 of 2001 parameters maximum number of bacteria divided into four classifications of water quality. class I Classification is water that can be used as raw water for drinking water, and or other uses that require the same water quality as that use. The total requirement for coliform bacteria in this class is 1000/100 ml. Classification class II, water the

designation of which can be used for infrastructure or facilities for water recreation, freshwater fish farming, animal husbandry, water to irrigate crops, and or other uses that require the same water quality as those uses. Condition the total coliform bacteria in this class is 5000 / 100 ml. Class III classification, water that its designation can be used for the cultivation of freshwater fish, animal husbandry, water for irrigate crops, and or other uses that require the same quality of water with these uses. The total requirement for coliform bacteria in this class is 10000/100 ml. Class IV classification, the designation of water can be used to irrigate crops and or other designation that requires the quality of water to be the same as the usage the. The total requirement for coliform bacteria in this class is 10000 / 100 ml. It can be seen that the use of water is actually divided into four according to the intended use.

It is also based ministry of Health Regulation No. 32 of 2017 states that the biological quality of water has a maximum total coliform bacteria in water of 50 CFU/100ml and a maximum of E.coli in water of 0 CFU/ml. The detection of E.coli bacteria in this study needs to be considered so that it does not cause disease problems in humans. Based on the presence of this bacterial content, it is an indicator of domestic waste contamination in this study in the form of livestock waste, one of which is feces which can cause diarrhea, typhoid and cholera (Prihartanto and Budiman, 2007).

Bacterial contamination in the water in this study was also influenced by human activities around the place. The higher the activity level of the population means that more domestic waste is generated by the population and causes a greater impact or pollution that will be caused on the quality of the water in the vicinity. Population density affects the amount of water microbial contamination Pollution from this waste has a very large role because it is closely related to community activities. Therefore it is important to pay attention to waste disposal and treatment ((Diana and Konsukartha, 2007).

Apart from having an impact on human health, the bacterial contamination found in this study will also have an impact on livestock products. This is because the well water is also used as drinking water for livestock, rinsing, and cleaning of cage equipment. This will also have a negative impact on livestock health.

Based on the results of Yogi's research (2013), the factors that influence the level of E. coli content are divided into four factors including groundwater depth, groundwater flow velocity, groundwater level gradient, and sewage system. Notoatmodjo (2007) states that water used for consumption must meet physical, chemical, and biological requirements. One of the biological requirements is the absence of harmful microorganisms in the water.

In connection with the importance of using water in people's lives, besides being used for drinking water, this water is also used to wash food ingredients so that if the water used is contaminated with pathogenic bacteria, it will become a medium for waterborne diseases which have detrimental effects on humans (Bambang et al., 2014).

5. CONCLUSIONS

Based on the results of this study, it can be concluded that there were 4 positive samples of E. coli out of a total of 10 water samples from water sources in the Narmada

livestock farms. The location of the water source close to the chicken coop on this farm is one of the factors causing this contamination.

Suggestions in this study it is necessary to carry out research on other bacterial contamination that is detrimental to human health and research is needed on residues of drugs used on these farms in well water.

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