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Study on Identification of Rats and the Existence of Leptospira Bacteria. sp in the Flood Area of Puskesmas Tempe, Wajo District

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Abstract

Background: Leptospirosis is one of the emerging infectious diseases caused by pathogenic bacteria called Leptospira and is transmitted from animals to humans (zoonosis). Mice as one of the reservoirs of leptospira bacteria found in urine and kidney. The aim of the study was to determining the presence of leptospira bacteria in rats in the flood prone area surrounding Community Health Center (Puskesmas) of Tempe, Wajo Regency. **Subjects and Methods:** The type of research used is descriptive research with observational approach. The samples in the study were rats caught with life trap in flood prone areas of Puskesmas Tempe area. Sampling is done by accidental sampling technique. Processing and data analysis is done by descriptive method and the kidney sample of the rattus was determined by PCR in the laboratory. **Results:** This study indicates that from the seven trapped rats, the types of rats in flood prone in Puskesmas Tempe area, Laelo and Salomenraleng villages, were Rattus tanezumi, Rattus norvegicus, Rattus Tiomanicus, which is none of them infected by Leptospira sp. **Conclusion:** In conclusion, the types of rats in flood-prone areas in the Tempe Community Health Center working area are Rattus tanezumi, Rattus norvegicus, Rattus Tiomanicus negatively contains leptopspira bacteria. Further research is needed with more samples, not only in the parameter areas but also in buffers with more sensitive methods.

Keywords: Leptospira sp, rat, flood prone area, Wajo District.

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Introduction

Leptospirosis is one of the emerging infectious diseases caused by pathogenic bacteria called Leptospira and transmitted from animals to humans (zoonoses). Transmission can occur directly due to contact between humans and urine or tissue of infected animals, and indirectly due to contact between humans and water, soil or plants contaminated with urine from animals infected with Leptospira. The usual entrance in humans is injured skin, especially around the legs, and or mucous membranes on the eyelids, nose, and mouth mucous membranes.[1]
Leptospira bacteria can be spread through food and drinks that are ingested, urine, water or transmitted through direct contact through the skin. The emergence of leptospira disease is influenced by risk factors such as the environment contaminated with leptospira, environmental conditions and lack of garbage disposal facilities, rampant rat habitat in residential areas, rice fields and peatlands and stagnant water contaminated by rat urine containing leptospira germs.[2]

The incidence of leptospirosis throughout the world is not known with certainty. In areas with extraordinary incidence of leptospirosis or in groups in areas with a high risk of exposure to risk factors for leptospirosis, the incidence of leptospirosis can reach more than 100 per 100,000 per year. In the tropics with high humidity the incidence of leptospirosis ranges from 10 - 100 per 100,000 while in subtropical areas the incidence ranges from 0.1 to 1 per 100,000 per year. Case fatality rate (CFR) of leptospirosis in some parts of the world is reported to range from <5% to 30%.[1]

The International Leptospirosis Society states that Indonesia is a country with a high incidence of leptospirosis and for its death rate Indonesia ranks third after Uruguay and India, with a mortality rate of 16.7%.[3] In Indonesia Leptospira can be found in pets such as cats, dogs, cows, pigs, buffaloes, and wild animals such as rats, ferrets and squirrels. Mice are the first animals identified as reservoirs of leptospirosis, which can transmit leptospira for the rest of their lives without showing clinical manifestations, namely as a carrier.

Areas of leptospirosis spread in Indonesia include West Java, Central Java, Yogyakarta Special Region, Lampung, South Sumatra, Bengkulu, Riau, West Sumatra, North Sumatra, Bali, West Nusa Tenggara, South Sulawesi, North Sulawesi, East Kalimantan and West Kalimantan.[4] Regions

with the highest number of incident deaths are some areas that often experience flooding, especially in DKI Jakarta and Central Java.[5]

Leptospirosis is a health problem in Indonesia, especially in areas prone to flooding. Based on the Indonesian Health

Profile of the Ministry of Health of the Republic of Indonesia in 2015, compared to 2014, there was a decrease in the number of cases from 550 cases to 366 cases in 2015. The significant decrease in cases of Leptospirosis occurred in DKI Jakarta (from 106 cases in 2014 to 37 cases in 2015) and East Java (from 61 cases in 2014 to 3 cases in 2015). However, in Banten, in 2014 there were no cases to 31 cases in 2015. The highest mortality rate from leptospirosis occurred in DKI Jakarta with a CFR of 16.98%. Although the number of cases in 2015 decreased compared to 2014, CFR due to leptospirosis increased from 11.27% in 2014 to 17.76% in 2015.[6]

In Indonesia, cases of leptospirosis were first discovered in Sumatra in 1971. At the beginning of 2002 a major flood occurred in Jakarta followed by an outbreak of leptospirosis in humans. The results of the examination of 142 rats caught after the extraordinary event which consisted of R. Norvergicus, R. Ratus diardii, R. Exulans and S. Murinus showed 54.9% serologically positive for leptospira.[7]

Flooding accounts for around 40% of disasters and causes around half of all deaths (Abaya, 2009 and Bich, 2011). The biggest flood hazard potential is in Asia. Every year for the past two decades more than 400 million people have been affected by floods on average. From 1987 to 1997, 44% of all flood disasters around the world occurred in Asia, and affected 228,000 people (about 93% of all deaths related to flooding worldwide). Floods cause water to turn into a source of disaster. Water is full of garbage, is pitch black, spreads unpleasant odors, and is a source of environmental-based diseases.[8]

Based on BMKG's forecasts there are four sub-districts in Wajo Regency which are prone to flooding. The causes of flooding that often occur due to the overflow of the Lake Tempe Walennae River with a high list of rainfall in December 2013 to January 2014. The four Districts.

Subjects and Methods

This type of research is descriptive with an observational approach, which is by analyzing the presence of leptospira bacteria, sp in mice, the characteristics of the location of catching mice, the type of mice caught, and the density of mice. This research was carried out in the Work Area of the Tempe Public Health Center in Wajo Regency, especially in the area of the homes of residents who were often affected by floods in the rainy season in January 2018 - April 2018. The population in this study were all rats in the Tempe Health Center Work Area, especially in flood prone areas. during the rainy season. The sampling technique is the accidental sampling method, which is by taking samples caught with the life trap during observation in the field. Traps were installed as many as 20 traps, per day. 10 traps for inside the house, and 10 traps outside the house. Trapping is carried out for 10 days. So that the traps are installed in the building as many as 10 pieces and outside the building as many as 10 pieces are scattered in locations where there are signs of existence and mice. Data analysis was carried out descriptively and presented in table form and analyzed accompanied by discussion of research results.

Results

This research was conducted in the working area of Tempe Public Health Center in Wajo Regency, namely Laelo and Salomenraleng village from April to May 2018, with a total sample of 7 samples. The study was a descriptive type of study with an international technique where all caught rats would be used as research samples. From the results of data processing that has been done, then presented in the form of a description.

The number of traps installed in Laelo Village was 20 traps for 5 days in Laelo Village, and managed to catch 2 rats. Whereas for Salomenraleng Subdistrict, the number of traps installed was 20 traps for 5 days and managed to catch 5 rats [Table 1].

Table 1: Distribution of the number of rats caught in Laelo and Salomenraleng villages based on the number of traps in Tempe village.

Location	Traps	Trapped rats	Success rate(%)
Laelo Village	20	2	10
Salemenralang Village	20	5	25
Total	40	7	35

Table 2: Distribution of Rat Species Caught by Sex and Location of Traps in Laelo and Salomenraleng Villages

Species	Trap location				Sex				Total	%
	In		Out		Male		Female			
	n	%	n	%	n	%	n	%	n	%
Rattus Novergicus	2	66.6	1	33.33	-	-	3	100	3	42.86
Rattus Tiomanicus	-	-	1	100	1	25	-	-	1	14.29
Rattus Tanezumi	-	-	3	100	3	75	-	-	3	42.86
Total	2	28.85	4	57.1	4	57.1	3	42.9	7	100%

Table 3: Distribution of Quantitative Morphological Identification of rats caught in Laelo and Salomenraleng Villages

No	Spesies	Qualitative morphology									
		Total (mm)		Tail (mm)		HF (mm)		Ear (mm)		Weight (gr/mm)	
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	R. Tanezumi	455	335	250	175	37	31	20	19	290	250
2	R. Novergicus	450	415	240	201	39		22	18	370	-
3	R. Tiomanicus	450	-	200	-	39		23	-	320	210

Note:

Total: Length from the tip of the tail to the tip of the nose, measured in a straight body position

Tail (ekor): Base length to the end of the tail

HF (Find Foot): Long your back foot from heel to tip of nail

Ear: Ear length from the base of the earlobe to the end of the ear

Weight: Rat weight

There were only 3 types of mice that were caught, namely Rattus Tanezumi, Rattus Novergicus, Rattus Tiomanicus, which were in the working area of the Tempe Health Center, specifically the Village of Laelo and Salomenraleng, Wajo District. For traps placed outside the home, there are more than hundreds of Novergicus types (66.6%), while for traps that are placed in the house, Rattus Tanezumi is more dominant (100%) [Table 2].

The results of rat identification based on quantitative morphology found species R. Tanezumi, R. Novergicus and R. Tiomanicus with a total of 7 tails [Table 3].

Mice obtained during the 5-day survey were obtained as many as 7 rats, consisting of R. Tanezumi, R. Tiomanicus, and R. Novergicus. Most of the rats that caught R. Tanezumi (42.9%) R. Novergicus (42.9%) and R. Tiomanicus (14.3%), caught rats were male (57.1) and female (42.9%) [Table 4].

Table 4: Distribution of Rat Catching Results in Laelo and Salomenraleng Villages

No	Species	Total based on sex				Total (%)
		Male		Female		
		Laelo	Salomenraleng	Laelo	Salomenraleng	
1	R. Tanezumi	0	0	1	2	3 (42,9)
2	R. Novergicus	0	3	-	-	3 (42,9)
3	R. Tiomanicus	1	0	0	0	1 (14,3)
	Total	1	3	1	2	7 (100)
	Caught	2/20* x 5** x 100 % = 5 %		2/20* x 5** x 100 % = 12,5 %		
Note: * Number of traps installed				** Number of days of trap		

Samples obtained during arrest were then examined for the presence of leptospira sp. Samples sent were samples that were considered adequate for further examination by the Polymerase Chain Reaction (PCR) method at the laboratory of the Maros Makassar Veterinary Centre, the results of laboratory tests showed that all samples (100%) tested negative contained leptospira sp. bacteria [Table 5].

Table 5. Distribution of test results of laboratory examination of Leptospira sp bacteria.

No	Samples	Organ observed	Result
1	Rat I	Kidney	Negatif
2	Rat II	Kidney	Negatif
3	Rat III	Kidney	Negatif
4	Rat IV	Kidney	Negatif
5	Rat V	Kidney	Negatif
6	Rat VI	Kidney	Negatif
7	Rat VII	Kidney	Negatif

Discussion

Characteristics of the location of catching rats in the work area of the Tempe Public Health Center, especially the Laelo and Salomenraleng Villages, where the traps were placed inside and outside the house, 7 rats were successfully caught. The number of rats caught in 2 tails in Laelo Village and 5 tails in Salomenraleng Village.

Laelo and Salomenraleng villages were caught outside the house, close to a landfill as many as 1 tail. While those caught near the sewerage channel were 2 tails, both of which were caught in Salomenraleng village, while none in the village area was caught at all. Traps that are installed that have puddles of water are not caught at all, both in the laelo village and in the salomenraleng village.

Traps that are installed in the house that have signs of being and mice for Laelo villages caught are caught 2 tails while for Salomenraleng villages that are caught are also 2 tails with a success trap of 35%.

The results of the identification of the morphology of rats caught in the Laelo village of Rattus Tanezumi, Rattus Tiomanicus while those caught in Salomenraleng Village were manifold, Rattus Tanezumi, and Rattus Novergicus with a total of 7 caught.

Rattus Tanezumi and Rattus Norvegicus are the most commonly found species and have a lot of contact with humans. Frequent contact between mice and human life will increase the risk of disease transmission. Mice are usually infected with Leptospirosis and zoonotic parasites which indicate a potential risk to human and domestic animal health. The state of the human habitation environment that has no hygiene and sanitation, and high rat density increases the risk of disease transmission.

The existence of these mice plays an important role in the epidemiology of disease transmission, because in addition to being a host, mice also act as reservoirs for several diseases that are considered deadly. In Indonesia alone found 6 zoonotic diseases transmitted by rats, namely PES, schistosomiasis, typhus scrub (bush fever), leptospirosis, eosinophilic meningitis (angiostrongyluscantonensis) and echinostomiasis.

The success of catching rats in Salomenraleng Village (12.5%) is higher than Laelo Village (5%). The success of this capture can illustrate the population density of mice in a place / environment. Rat species found in Laelo and Salomenraleng villages consist of Rattus Tanezumi (house mouse), Rattus tiomanicus (tree rat), and Rattus Novergicus (got rat).

The identification process is very important to find out what species are caught. Mouse identification begins with the taxonomy, which is the science of classification theory which includes the bases, principles and procedures / rules as well as the variation analysis.

More simply, taxonomy can be considered as the science of naming an organism. Identification based on sex of caught mice showed that it was almost the same between male sex (54.55%) and female (45.45%). The size of the testicle uses the length x width formula using a ruler / ruler. Testicular size of R. Tanezumi was maximum 21x13 and a minimum of 4x6, R. Tiomanicus 13x25, and R. Novergicus. The mamae formula for the R. Tanezumi species is 2 + 3, meaning 2 pairs of mammals that grow on the chest, and 3 pairs of mammals that grow in the stomach.

The success of catching rats in Salomenraleng Village (12.5%) was higher than that of Laelo Village (5%). The success of this capture can illustrate the population density of mice in a environment. Rat species discovered in the Village Laelo and Salomenraleng consists of Rattus tanezumi (house mice), Rattus tiomanicus (tree shrew), and Rattus novergicus. The success of this rat catch can describe the rat population roughly in an environment. Murtiningsih research results in Yogyakarta Province, showed that the presence of mice in the house is a risk factor for leptospirosis in residential areas with odds ratio (OR) 4.5-6.8).[10]

The results of the rat survey were only found from R. Tanezumi (42.9 %), R. Tiomanicus (14.2%) and R. Novergicus (42.9%). This relates to the location of trapping locations around relatively densely populated settlements. R. Tanezumi known as a commensal rat which means having habitat in the house and plays an important role in the transmission of leptospirosis. R. Tanezumi spent his whole life searching for food, nesting, sheltering and breeding in the house, thus the number of mice caught in the house was more (71.4%) than outside the house (28.6%). Female mice were caught (42.8%) and males (57.2%). The number of male and female rats caught was not much different because female rats had the task of foraging for their children, so they could repeatedly come out of their nests to get more food during breastfeeding and pregnancy.

A study showed that female rats were foraging individuals for their children while male rats acted as guardians of their nests or territorial areas so that female rats tended to be more easily caught because of this foraging activity, in addition to mouse behaviour in keeping nests and fighting for male rats, and instincts for caring for and caring for female rats are affected by hormonal hormones and the sex hormones produced by the endocrine glands found in the hypothalamus, which are the base and nisi thicken in the third ventricle of the rat's forebrain.[11]

R. Tanezumi is known as a house mouse whose existence is very close to humans, where the rat's nest, find food, and breed around human life. The presence of rats in the home increases the risk of leptospira infection with OR 7.360 and is statistically significant (Berty Murtiningsih et al, 2004). Leptospira infection occurs due to the condition of the settlement environment found by mice so that in the event of contamination by urine the mice infected with Leptospira bacteria can easily be infected with humans. Transmission can be through contact between the skin, especially if the skin is injured and mucous membranes with water, moist soil or plants contaminated with the urine of animals infected with leptospira.[12]

Leptospirosis is caused by pathogenic leptospira bacteria classified into several species based on DNA-DNA hybridization and is also classified into several serovar based on the MAT test.[13] Bacteria L. Icterohaemorrhagiae javanica and L. cynopteri are serogroups of the pathogenic Leptospira group found in rats and known to be virulent to humans. Research to distinguish pathogenic and non-pathogenic leptospira is very important and useful for epidemiological data in controlling leptospirosis in the community. Certain serovar will develop into commensal or have a mild pathogenic relationship with animal reservoir species, such as harjo serovar in cattle, canicola serovar in dogs, and rats by icterohaemorrhagiae and copenhageni.[13]

Leptospira bacteria, especially species of L. cterrohaemorrhagiae, are very common in rats (Ratus norvegicus) and house rats (Ratus tanezumi). Leptospira bacterial infection in R. Tanezumi is thought to be naturally preserved which is inherited through heredity or between host reservoirs that are exposed to leptospirosis first. R. Tanezu mi is known to have a urine pH that is suitable for the development of leptospira bacteria so that rats of this species are most commonly found in leptospira bacteria.[14]

The presence of R. Tanezu mi which is close to humans makes the risk of transmission of leptospirosis even greater, so it needs an effort to reduce stagnant water sources, as one

of the rats' nests. It is necessary to remember that the leptospira is the easiest to infect humans through the open surface of the body, especially the wound, the skin that is submerged for a long time will become soft and soft so it is easy to enter. Spira is able to survive outside the body of mice for 7-12 hours depending on the media and where the bacteria are located, but there are other opinions that say that leptospira bacteria spores outside the body of mice can last for weeks on media with alkaline pH.[15-19]

Mice are rodent animals (Rodentia) which are better known as pests of agricultural crops, destroyers of goods in warehouses, and disgusting disturbing animals in housing. Commensal Rodentia which are Rodentia that live near the place of life or human activities are important things to consider in disease transmission.[20]

Results Leptospirosis examination that was conducted in April-May in 2018 in the Village Laelo And Village Salomenraleng with PCR test showed that all negative samples leptospira Sp. Rat R. Novergicus habitats are found because there is water in the form of gutters Salomenraleng and Laelo Village area and the presence of rat R. tanezumi because the areas close to population centres so that users can migrate to find food.[20]

According to Sarkar et al. (2002) in Tri Ramadhani (2011) Mice found at home 4.5 times the risk of being identified as a reservoir of leptospirosis. Leptospira bacteria sp attacks on mice such as rats R. Norvegicus and R. Tanezumi.[16-19]

In the research of Bina Ekawaty and Sunaryo (2012) stated that the rat species R. tanezumi and Suncus murinus positively contained leptospira bacteria by using a microscopic examination of Agglutination Test (MAT). This allows the presence of leptospira strains of bacteria in rats in the area of Laelo and Salomenraleng villages which are a residential neighbourhood which is one of the potentials for the spread of leptospira bacteria. Laelo and Salomenraleng villages are areas that are always affected by floods when the rainy season arrives. Various theories state that stagnant water in the environment can be a source of indirect transmission if the water is contaminated with urine from effective animals.

In a study conducted by Anna Erviana (2014) that leptospirosis patients in Cengkareng Subdistrict were 100% there were mice in it. In this study also stated that a bad ditch (61.1%) was one of the causes of leptopspirosis.[17] Whereas a study conducted by Siti Maisyaroh et al. (2014), that poor sewer conditions were 7.1 times more likely to be affected by leptospirosis. Poor sewer conditions can invite and become habitat for rats.[18]

Darmodjono (2001) in Anna Erviana (2014) states that rats like to nest in gutters and ditches. Whereas mice are animals that carry leptospira microorganisms. Therefore, it is attempted that the gutters do not become rat nests and the water flows smoothly.[17] Sewers contaminated with rat urine can be a medium for disease transmission. Mice usually urinate in an area that has a pool of water and from this pool of water, the leptospira bacteria will enter the human body.

Conclusion

In conclusion, the types of rats in flood-prone areas in the Tempe Community Health Center working area are Rattus tanezumi, Rattus norvegicus, Rattus Tiomanicus negatively contains leptopspira bacteria. Prevention efforts was carried out with sanitation improvements, life traps and chemicals. It is recommended for the Puskesmas, especially for the person in charge of the working area of Laelo And Salomenraleng Village, to always improve the conditions of environmental sanitation, especially waterways and areas that have the potential to become mice breeding through increasing health promotion to the community. For the community and across sectors in an effort to break the breeding of mice in the Tempe Community Health Center working area, in terms of improving sanitary conditions, garbage disposal sites, and buildings that can be a breeding ground for mice. For further researchers to take a larger sample with more installation time and the number of traps and examination using the MAT method.

References

1. Anies, et al. 2009. Environment and Behaviour in the Event of Leptospirosis, http://eprints.undip.ac.id/. Dated December 30, 2016.
2. MoH Republic of Indonesia. 2014. Technical Guidelines for Controlling Leptopspirosis. Jakarta: Ministry of Health Republic of Indonesia.
3. WHO 2004. Human Leptospirosis Guide for Diagnostic, Surveillance and Control. Chennai: World Health Organization.
4. MoH Republic of Indonesia. 2008. Guidelines for Control of Special Mice in Hospitals. Jakarta: Ministry of Health of the Republic of Indonesia.
5. MoH Republic of Indonesia. 2009. Indonesian Health Profile 2008. Jakarta: Bakti Husada.
6. Abaya, SW, Mandere, N., Ewald, G .2009. Flods And Health in Gambella Region, Ethiopia: A Qualitative Assessment of The Strengths And Weaknesses Of Coping Mechanism. [online] http://www.ncbi.nlm.gov/pmc/articles/PMC2792158/ [Accessed on January 7, 2017]
7. Muslimah, N., Putro , HS2014. Floods and Diarrhea in Jatinegara Subdistrict East Jakarta . [Online]http://journal.unnes.ac.id/sju/index.php/geo/imageartifie/view /4316 [accessed on January 15 2017]
8. Alamsyah Dedi, Ratna MW. 2013. Basic Pillar of Public Health Sciences. Nuha Medika. Yogyakarta
9. Ramadani Tri, Yunianto Bambang. 2011. Reservoir and Cases of Leptospirosis in the Extraordinary Events Area, http://www.researchgate.net/ accessed on June 19, 2017.
10. Erviana A. 2014. Epidemiology Study of the Occurrence of Leptospirosis When Flooding in Cengkareng Subdistrict January -

February 2014 Period, Thesis, Epidemiology Department Syarif Hidayatullah Islamic University, Jakarta http://repository.uinjkt.ac.id accessed on 30 December 2016
11. Maysaroh, S et al. 2014. Environmental Factors Related to the Occurrence of Leptopspirosis in Pati District, Central Java, https: //media.neliti.com/. accessed on June 20, 2017
12. Medway L. The wild mamals of Malaya and Singapore. Kuala Lumpur: Oxford University Press; 1978
13. Kia EB, Homayouni MM, Farahnak A, Mohebali M, Shojai S.Study of endoparasites of rodent and heir zoonoticimportance in Ahvaz, South West Iran. Publ. Health 2001; 30 (1-2) : 49-52
14. Nursia I, Ristiyanto, Rodensia-sourced Disease in Indonesia, Journal of Health Ecology. 2005; 4 (3): 308-19.
15. Ismanto H, MarbawatiD. Identification of mice (results of training at the Indonesian Institute of Sciences Mammals Laboratory, Jakarta). BALABA, 2011; 7 (2): 46-8.
16. Maysaroh, S et al. 2014. Environmental Factors Related to the Occurrence of Leptopspirosis in Pati District, Central Java, https: //media.neliti.com/. accessed on June 20, 2017.
17. Erviana A. 2014. Epidemiological Study of the Occurrence of Leptospirosis When Flooding in Cengkareng District Period January - February 2014, Thesis, Epidemiology Department Syarif Hidayatullah Islamic University, Jakarta http://repository.uinjkt.ac.id accessed on 30 December 2016.
18. Maysaroh, S et al. 2014. Environmental Factors Related to the Occurrence of Leptopspirosis in Pati District, Central Java, https: //media.neliti.com/. accessed on June 20, 2017.
19. Priyambodo S.2009. Gendalian Pen Hama Rat Terpadu.Ed all 4. Jakarta: Spreaders Governmental; 2009.
20. Raharjo J, Ramadhani T. Study of rat density and ectoparasites (fleas) in focal areas and former pes. Bnjarnegara P2B2 Research and Development Center; 2012.

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