
Characteristic of Rats as Reservoirs of Leptospirosis

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Abstract

Background: Globally, the incidence of leptospirosis was ≥ 500.000 cases especially in Indonesia, the mortality rate of leptospirosis reached $>5\%$ in 2004-2012. Two suspected cases are found in Banyumas area since 2010 to May 2014. The purpose of this study was to identify the reservoir of leptospirosis. **Method:** The study was cross-sectional. The Location conducted in Kedung Pring village, Kemranjen sub district and Beji village, Kedung Banteng sub district in Banyumas. **Results:** The species of rats are called *Rattus tanezumi* and *Suncus murinus*, however *Mus musculus* is found in Beji village. The trap of rat was succeed in each location was 15% for Beji Village kedung Banteng sub district and 14.14% for Kedung Pring village, Kemranjen sub district. **Conclusion:** All of species rats that are potentially transmitted for leptospirosis.

Keywords: banyumas; leptospirosis; rats

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1. Introduction

Leptospirosis is known a zoonosis disease in worldwide. World Health Organization (WHO) estimates that the incidence of leptospirosis occur ≥ 500.000 cases annually worldwide, with a higher incidence of poor populations in developing countries and tropis regions.⁽¹⁾ Leptospirosis is found in rural areas that higher in populations exposed to many livestock and also in urban slums that adequate sanitation to the rat's life as a reservoir of leptospirosis.⁽²⁾

The most important reservoir of leptospirosis are rodents, especially rats. Rats, mice, dogs, pigs and cattle are the main source of infection in human.⁽³⁾ *Leptospira* maintained in the liver and kidneys of rats during his life and excreted in the urine in significant amounts in the active phase and the carrier phase which asymptomatic with increasing age of the animal, the excretion of bacteria in the urine increased.⁽⁴⁾ Human infection occurs by chance after contact with contaminated materials. These bacteria enter the body through skin wounds or mucous membranes. Transmission of leptospirosis in humans occurs through direct contact with infected urine of animal or indirectly through contaminated water or soil infected urine with *Leptospira*.

The incidence of leptospirosis in Indonesia from 2004-2012 fluctuated. the In 2004 to 2012, mortality rate of leptospirosis in Indonesia reached $>5\%$. The mortality rate decreased in 2004-2008, while those increased annully within 2009 to 2012 (6.87%; 10.51%; 9.57%; 12.13%).⁽⁵⁾ In Central Java, there are several districts with the problem of leptospirosis among Semarang, Demak, Klaten, Purworejo, Jepara, Sukoharjo, Cilacap, Banyumas, Purbalingga and Banjarnegara.⁽⁶⁾

Leptospirosis cases in Banyumas discovered since 2010. Following Rapid diagnostic test (RDT) is found five cases in 2011. Meanwhile, in 2012 to 2013 is found six cases of leptospirosis. Health service office of Banyumas reported in May 2014, there were two cases of leptospirosis in Beji Village District of Kedung Banteng and Kedung Pring village District of Kemranjen.⁽⁷⁾

The results of epidemiological investigation conducted by a team of local health centers and the Health Department of Banyumas showed that based on patient activity and risk factors the source infection was from the surrounding environment so that the spot survey was conducted to determine the source and causes so the efforts and prevention so the leptospirosis was not widespread. The purpose of this study is to identify the reservoir of leptospirosis. Hopefully with this spot survey we can know the characteristics of reservoir as transmitters of leptospirosis.

2. Method

This research was cross sectional study approached. The location of research were Beji Village District of Kedung Banteng and Kedung Pring village District of Kemranjen. The research done in May 2014. The rats survey as follow this steps:

a. The trapping rats

Catching is done in three days consecutive. Trapping in the afternoon starting at 16:00 pm and then the trap was taken the next day between 06:00 to 09:00 pm. The number of traps are placed 160 for each location. Catching in the home used two traps while outside the home, each area of the extent of 10 m² used two traps with trap doors opposite each other. Mounted bait is roasted coconut that should be changed every day. Traps were left in place for 2-3 days, but every day traps should be checked. Rat trap containing label and put into a cloth bag that was strong enough then continue to rat processed.

b. Identification of rat and shrew

For identify the rats as follow the steps:

- 1) Rats measured the total length, from tip of nose to tip of tail (Total Length/TL), units in mm.
- 2) Measured rat tail length, from base to tip (Tail/T), units in mm.
- 3) Rats were measured length rear foot, from the heel to the tip of the nail (Hind Foot/HF), units in mm.
- 4) Rats measured ear length, from the base of the ear to ear tips (Ear/E), units in mm.
- 5) The rats were weighed. Unit weight in grams
- 6) Female rats calculated amount of nipple (mammary) on the chest and abdomen. Suppose the result: 2+3=10, meaning that two pairs in the chest and three pairs in the abdomen together with 10 pieces.
- 7) The rats were observed color and hair type top and bottom, color and tail length and the shape and size of the skull.
- 8) Using rats identification key, specify the type mice identified.

3. Results and Discussion

The species of rats was found *Rattus tanezumi*, *Mus musculus* and *Suncus murinus* in Beji Village District of Kedung Banteng. The most common species rat was *R. tanezumi* (74.5%).

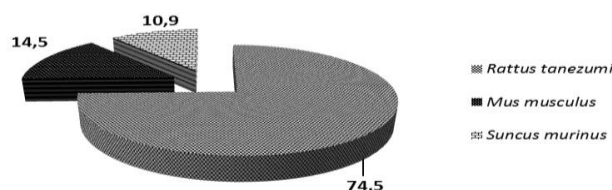


Figure 1. Rats and Shrew Species Found in Beji Village District of Kedung Banteng 2014

R. tanezumi and *S. murinus* were found in Kedung Pring village District of Kemranjen (53.1%)

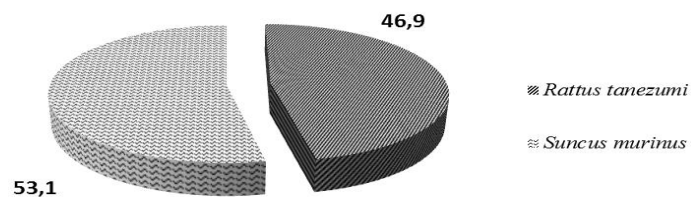


Figure 2. Rats and Shrew Species Found in Kedung Pring District of Kemranjen 2014

Catching of rats in those both locations showed that were caught not too varied. The process of identification of rats was conducted to determine the type of species that caught. Identification of rat conducted with regard to involving taxonomic classification can be considered as the science of naming an organism. Certain *Leptospira* serovar also known to have a commensal relationship with a particular animal host species, such as rats were associated with serovar *icterohaemorrhagie* and *copenhageni*,⁽⁸⁾ while rats associated with serovar *ballum*.⁽⁹⁾ Density of rats and shrew was one of the risk factors for leptospirosis. Picture of finding the location of rats either within or outside the home can be seen in the picture below.

Figure 3 shows the *R. tanezumi* more commonly found in the home, while the *S. murinus* (shrew) more commonly found outside the home

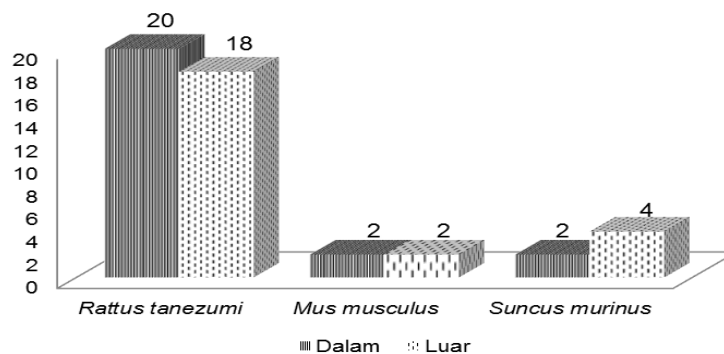


Figure 3. Catching of rats based on the location found in Beji Village District of Kedung Banteng 2014

Figure 4 showed that *R. tanezumi* more commonly found in the home. *Suncus murinus* also found inside and outside the home. Most species caught in Beji Village District of Kedung Banteng was *R. tanezumi* (38), whereas in the Kedung Pring village District of Kemranjen balanced between *R. tanezumi* (23) and *S. murinus* (24). *Rattus tanezumi* known as house rat and in both of study sites were more common in the house due to its habitat in the settlement and has adapted well to human life and activity-dependent (food and shelter) on human life and called commensal rodent. Research by Murtiningsih (2003) in Yogyakarta and surrounding concluded that the rats met in the home increases the risk of occurrence leptospirosis.⁽¹⁰⁾

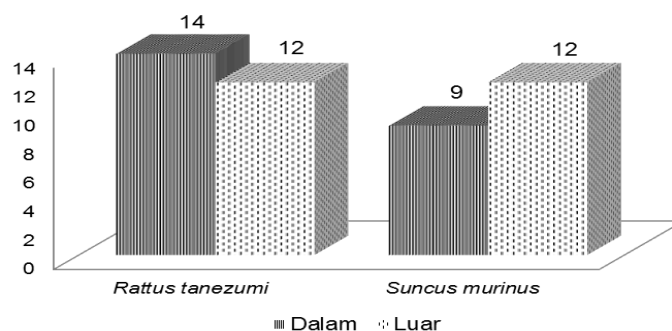


Figure 4. Catching of Rats Based on the Location Found in Kedung Pring Village District of Kemranjen 2014

Shrew (*S. murinus*) in Beji village district of Kedung banteng more found outside the home because they made a nest, breeding and foraging tend outdoors than indoors. *Suncus murinus* actually does not belong to a group of rats but insectivores that have morphology, behavior and reservoir reservoir of disease same as rats.⁽¹¹⁾

Rattus tanezumi and *M. musculus* were a type of rats commonly found in the environment within and around the house. The morphologically characteristics of *R. tanezumi* were caught have characterized hair texture is rather coarse, shape of the nose cone, cylindrical body shape, body color black brown gray dorsally, body color black brown gray abdomen, upper tail color dark brown, the color of the bottom of the brown tail black. Habitat of this species was usually found in the house and warehouse. According to Priyambodo, *R. tanezumi* have the characteristic features total length of quantitative traits (PT) 220-460 mm, length of tail (T) of 120-250 mm, the length of the rear foot (HF) 30-37 mm, the width of the ear (E) (19-23 mm), weight (W) 60-300 grams and mammary formula 2+3, which means two pairs of mammary growth in the chest and three pairs of mammary growth in stomach.⁽¹²⁾

Suncus murinus/shrew has a characteristic shape of pointed muzzle, very short tail, runs relatively slow, wet dirt and odor as it passes from glands near the hole anal glands. Very short tail shrew characterize that shrew was an animal that is not a good climber. Wet dirt indicates that the main feed of the shrew is insects (animal protein). Quantitative morphological characters show Total length (PT) 180-205 mm, length of tail (T) 64-78 mm long, rear foot (HF) 17-21 mm, the width of the ear (E) 4-14 mm, body weight (W) 30-60 grams, and the formula mammary 0+3, which means only 3 pairs of mammary growth in stomach.⁽¹³⁾

Mus musculus (mice) was caught has characterized the upper and lower body color brown gray, there was also a bit more color under white body and tail plain like her, many are in the house and also on grass outdoors. Relatively small body size with body weight 10-21 grams. Total length (PT) of about 175 mm, the length of the tail (T) 95-115, long rear foot (HF) 12-18 mm, the width of the ear (E) 8-12 mm and mammary formula 3+2 mice (*Mus musculus*) is relatively resistant to drink only when thirsty and find water.⁽¹²⁾

Catching of rats in Beji Village District of Kedung Banteng obtained trap success by 15%, while in Kedung Pring village District of Kemranjen trap success obtained by 14.14%. Trap Success in Beji village slightly larger than in the Kedung Pring village. This is because the Beji Village area of more densely populated than Kedung Pring village of the territory dominated by plantation. So that more food availability in Beji village.

The success rate of this catching can describe the relative density of the rat population in a place or environment, success trap numbers are taken into account the total number of trap success. When compared with the existing literature categorized as high if successful trap worth 7% or more on trapping in the house and 2% outside house.⁽¹⁴⁾ Some factors affecting the success rate of catching is the quality of the trap, bait selection and density of rats. The success of the catching was also influenced by the proper placement of rat traps for rats have thigmotaxis properties that have the same trajectory while foraging, nesting and other daily activities. The existence of an animal reservoir itself is affected by the condition of the home building and remodeling homes, garbage and food availability. Priyambodo (2006) explains that a dirty environment is a preferred place for rats.⁽¹⁵⁾

The type of rats are found in the outbreak of Leptospirosis in Jakarta and Bekasi are: *R. norvegicus*, *R. diardii*, *S. murinus* and *R. exulans*.⁽¹⁶⁾ Other previously study reported in Semarang in 2008 and 2009 found *R. tanezumi* and *Bandicota bengalensis* infected with serovar *Bataviae* while *R. norvegicus* infected with serovar *Bataviae* and *Hardjo*. It also found *R. exulans* and *Bandicota indica* infected with *Leptospira*.⁽¹⁷⁾ Based on the results of serological tests were conducted in 2005 and 2006 in several areas such as Klaten in Central Java, Semarang, Demak, Purworejo find three species of rodents as potential reservoirs of *Leptospira* were *R. tanezumi* (house rat), *R. norvegicus* (riul rat) and *R. exulans* (field rat).⁽¹⁸⁾

Types of *Leptospira* transmitted by rats are most harmful to humans than all existing types of *Leptospira* in domestic animals. Rats released the *Leptospira* in high concentrations (10^7 organisms per ml) for months after infected.⁽¹⁹⁾ The proportion of the *Leptospira* infection in rats increased following the old of the rats.⁽²⁰⁾ The prevention and control of leptospirosis programs needed comprehensively strategies.

4. Conclusion

Species that caught on this research were *Rattus tanezumi*, *Mus musculus* and *Suncus murinus*, that all of them were potentially transmit leptospirosis.

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