

Research Article

Diversity of *Leptospira* spp. in Rats and Environment from Urban Areas of Sarawak, Malaysia

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Various prevalence studies on *Leptospira* in animals and humans, as well as environmental samples, had been conducted worldwide, including Malaysia. However, limited studies have been documented on the presence of pathogenic, intermediate, and saprophytic *Leptospira* in selected animals and environments. This study was therefore conducted to detect *Leptospira* spp. in rats, soil, and water from urban areas of Sarawak using the polymerase chain reaction (PCR) method. A total of 107 rats, 292 soil samples, and 324 water samples were collected from April 2014 to February 2015. Pathogenic *Leptospira* was present in 5.6% (6/107) of rats, 11.6% (34/292) of soil samples, and 1.9% (6/324) of water samples. Intermediate *Leptospira* was present in 2.7% (8/292) of soil samples and 1.9% (6/324) of water samples. Saprophytic *Leptospira* was present in 10.3% (11/107) of rats, 1.4% (4/292) of soil samples, and 0.3% (1/324) of water samples. From this study, 76 *Leptospira* spp. were isolated. Based on DNA sequencing, the dominant *Leptospira* spp. circulating in urban areas of Sarawak are pathogenic *Leptospira noguchii*, intermediate *Leptospira wolffii* serovar Khorat, and saprophytic *Leptospira meyeri*, respectively. Overall, this study provided important surveillance data on the prevalence of *Leptospira* spp. from rats and the environment, with dominant local serovars in urban areas of Sarawak.

1. Introduction

Leptospirosis is a zoonotic disease with worldwide distribution and caused by pathogenic *Leptospira*, which results in significant public health problem worldwide [1, 2]. The genus *Leptospira* consists of 20 species, with more than 300 serovars, grouped into 20 serogroups [3]. Based on the pathogenicity, they can be divided into three major clades, namely, pathogenic, saprophytic (nonpathogenic), and intermediate (unclear pathogenicity) [2]. The pathogenicity status of intermediate *Leptospira* remains a debate matter. For instance, hamsters inoculated with intermediate *L. inadai* and *L. licerasiae* do not cause any clinical manifestation of leptospirosis although both recovered from patients [4].

Humans usually get infected through direct contact with the infected animal urine via mucous membrane and exposed skin or indirect contact by exposure to the contaminated soil, water, and food [5–7]. Normally, maintenance hosts are asymptomatic while accidental hosts like humans may suffer

a wide range of clinical manifestation such as renal failure, hepatic failure, severe pulmonary haemorrhage, and even death [8]. The overall case mortality rate in humans ranges from 1 to 5% and the elderly are claimed to have higher infection risk of leptospirosis [9]. Incidence rates are often underestimated because of the relative inaccessibility, lack of rapid diagnostics, and insufficient awareness of leptospirosis [10].

Similar prevalence studies on *Leptospira* spp. had been conducted in Malaysia in recent years. *Leptospira* had been isolated from urban rats of Kuala Lumpur [11] as well as soil and water from urban sites in Peninsular Malaysia [12]. The presence of *Leptospira* spp. was also reported in National Service Training Centres of Peninsular Malaysia [13]. Moreover, Thayaparan et al. [14] reported the presence of *Leptospira* spp. in wildlife around tourism areas in Sarawak. Our previous study highlighted the presence of *Leptospira* spp. in national parks [15]. The presence of *Leptospira* spp. in this area posed the risk of transmission and infection to humans. Since this study on the detection of *Leptospira* spp. in rats, soil and