Characterization of *Leptospira* infection in suckling and weaning rat pups

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Rats are known to be the most important reservoirs of *Leptospira* spp. However, the leptospiral dose and age at which rats become resistant to *Leptospira* infection are not yet well elucidated. Aimed to characterize leptospirosis in rat pups, we found that suckling pups (4-, 7-, and 14-day old) are susceptible to leptospires and resistance starts from the weaning age (23-day old). Susceptibility of rat pups was also affected by the infecting dose of the organisms. Jaundice, decrease in body weight, and neurological symptoms prior to morbidity was evident in infected suckling pups. However, 23-day-old infected pups did not manifest any pathological changes and were able to survive the infection similar to adult rats. Based on these results, we propose the suckling rat pup as a novel animal model of human leptospirosis to investigate pathogenesis, development of host resistance, and the mechanisms involved in rats becoming maintenance hosts for leptospires.

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1. Introduction

Leptospirosis, caused by pathogenic *Leptospira*, is well known as a worldwide zoonosis, which is endemic in tropical and subtropical areas [1]. Its clinical manifestations make it difficult to differentiate from other tropical infections [1]. In spite of the fact that this disease is spreading from various animals to other animals and to humans, the mechanisms involved in the pathogenesis of *Leptospira* are still largely unknown, making it a major public health problem [1,2].

*Leptospira* are thin, highly motile and helically coiled bacteria that belong to the family *Leptospiraceae* [1]. Pathogenic leptospires invade the susceptible host’s body through abrasions or lesions of the skin or through the mucous membranes. These organisms then spread to all of the organs following circulation through the blood stream [3]. The duration of the bacteremic phase is from 4 to 7 days and would be followed by very mild symptoms or severe illness, which may sometimes lead to death [3,4]. This outcome of infection may be due to direct effects of the pathogen or genetically determined host immune responses [4].

Mild leptospirosis is difficult to distinguish from other infections as it has non-specific symptoms such as fever,