

SHORT PAPER

Prevalence of *Leptospira* spp. in various species of small mammals caught in an inner-city area in Switzerland

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SUMMARY

In order to establish the leptospira carrier rate of small animals in an urban environment, small rodents and shrews were captured in the city of Zurich, Switzerland. Kidney specimens of 190 animals were examined using a leptospira specific PCR assay. Leptospiral DNA was amplified in kidneys of 12·6% of the animals.

Leptospirosis is one of the most common bacterial zoonoses worldwide. It affects humans as well as a wide variety of wild and domestic animals. Humans usually contract the disease from animals which excrete the leptospire in their urine. Small mammals, predominantly rodents, are one of the principal sources of leptospirosis. Leptospire can enter the body through abraded skin or mucous membranes. The risk of human-to-human transmission is thought to be insignificant. Occupational exposure (sewer workers, abattoir workers, veterinarians, farmers) to leptospire is common. Leptospirosis has also been reported to be associated with recreational activities [1–4]. The severity of the disease varies from a mild self-limiting illness to a fatal fulminating infection. It is suspected that many cases of leptospirosis remain undiagnosed because symptoms are often minimal and non-specific. Recently, leptospirosis has been recognized as a re-emerging infectious disease in some urban centres [5]. To establish the leptospira carrier rate in an urban environment, small rodents and shrews were captured in parks in the city of Zurich. Kidney specimens of 190 animals were examined with a leptospira-specific PCR assay.

Between 1998 and 1999 mice, voles and shrews were trapped in various parks within the city of Zurich. We examined 60 kidneys of *Arvicola terrestris*, 60 of *Apodemus sylvaticus*, 50 of *Clethrionomys glareolus* and 20 kidneys of shrews belonging to the genera *Crocidura* and *Sorex*. Approximately 25 mg of renal tissue was cut into small pieces and its DNA purified using the QIAamp® DNA Mini Kit (Qiagen, Hilden, Germany). PCR assay and hybridization were performed as described by Merien et al. [6]. Briefly: a 331-bp fragment was amplified from the 16S rRNA gene of leptospira. To increase the sensitivity and specificity, PCR products were hybridized with a probe specific for the 16S rRNA gene of leptospira.

To determine the sensitivity of the test, cultured leptospira (*L. interrogans* sv. *icterohaemorrhagiae*, strain RGA) were counted in a Thoma chamber, serially diluted, and mixed with homogenized kidneys of specific pathogen-free mice. Purification of DNA, PCR and hybridization were performed as described above. It was possible to detect 1200 microorganisms by a visible band on the agarose gel. The lower limit of detection by hybridization was 12 organisms. The specificity of the PCR assay was tested with bacteria commonly found in rodents, namely *Bordetella bronchiseptica*, *Citrobacter rodentium*, *Corynebacterium kutscheri*, *Pasteurella multocida*, *Pasteurella pneu-*

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Table 1. *Detection of leptospira DNA by PCR in kidneys from mice and shrews*

Animals	No. of animals	No. (%) of animals with positive results
<i>Arvicola terrestris</i>	60	8 (13.3)
<i>Apodemus sylvaticus</i>	60	7 (11.7)
<i>Clethrionomys glareolus</i>	50	5 (10.0)
<i>Crocidura</i> spp., <i>Sorex</i> spp.	20	4 (20.0)
Total	190	24 (12.6)

mophila, *Erysipelothrix rhusiopathiae* and *Streptobacillus moniliformis*. PCR with all these bacteria was negative.

Leptospiral DNA was found in kidney samples of 12.6% of the captured animals with carrier rates of 10–20% in different species (Table 1). Although outbreaks of leptospirosis in tropical countries have been described [4], they seem to be rare in temperate zones where usually only sporadic cases occur. Seroepidemiological studies, however, suggest that undiagnosed urban leptospirosis may be common in temperate climates. Childs et al. [7] found antibodies to leptospirae in 16% of the residents of Baltimore, Maryland. In a nationwide survey leptospira antibody prevalence in the Italian population was 0–40.8% in various regions [8]. The risk of infection from leptospirae was high in urban dwellers and seemed to be linked to an unknown urban risk factor. Contact with animals, especially rodents, has been described as a risk factor [8, 9]. Cases of urban leptospirosis have been reported in Baltimore, Maryland and Detroit, Michigan [5, 10]. In a subsequent study, 19 of 21 kidneys of rats caught in selected areas of Baltimore were positive for leptospira by PCR [5]. In Detroit 77.4% of rats were found to have antibodies to *Leptospira interrogans* sv. *icterohaemorrhagiae*, and 91.9% of kidney sections were positive for leptospirae using silver stain [11]. Data on the prevalence of leptospirae in small mammals are rare in Europe. Webster et al. [12] found antibodies to leptospirae in 14% of wild brown rats (*Rattus norvegicus*) on British farms. In an extensive study of 17 species of small mammals including rats in South Bohemia, Czech Republic, antibody prevalence was 1.6–7.6% in various locations [13]. We present here the first survey of the prevalence of leptospirae in small mammals in a European city. The prevalence of 12.6% of leptospirae in small rodents and shrews in the city of Zurich appears to be moderate. Comparison with the

data published so far is difficult due to the varying methods employed and the varying animal species captured. However, prevalence of leptospirae in small mammals of Zurich seems to be of the same order as that in European rural regions and substantially lower than prevalences in Detroit and Baltimore. Therefore, the risk of contracting leptospirosis from small mammals in Zurich seems to be lower than in Detroit or Baltimore. However, a case of urban leptospirosis in Switzerland has been reported recently [14].

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