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Letter to the Editor

Red swamp crayfish collecting: a risk activity for leptospirosis

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To the Editor,

Leptospirosis, commonly known as 'rat fever', is a worldwide zoonotic illness caused by the Leptospira genus [1,2]. Isla Mayor is a municipality in Seville, Spain, with a total population of 5911 inhabitants; it is surrounded by over 24 000 hectares of rice fields. It forms part of the Doñana National Park ecosystem, an area protected for its biodiversity, where no chemical substances may be used which might harm this natural environment. An increase in the rat population associated with the richness of the ecosystem and limitations on the use of biocides have made Isla Mayor a perfect breeding ground for *Leptospira* infection among wetland workers, especially rice labourers and collectors of red swamp crayfish (*Procambarus clarkii*).

Crayfish collectors work with their feet and hands submerged in water and mud, and most professionals opt not to wear protective equipment. The crayfish collectors are self-employed workers who supply crayfish processing and marketing companies that now constitute the world's second largest exporter of red swamp crayfish.

The objective of this study was to determine leptospirosis seroprevalence in the municipality's population where its incidence has increased over the last few years and to identify the risk factors associated with the illness.

To estimate the sample size of the study, we assumed a serological prevalence of 21.3% in accordance with the study carried out by Dastis-Bendala et al. [2]. An observational, descriptive, transverse study was carried out with a sample population of 294 from Isla Mayor between June 2017 and June 2018; the study was conducted in several periods that were equivalent in terms of exposure, before work activity began in the wetlands, which takes place between the months of July and October. The population was classified into three groups: red swamp crayfish collectors (102 subjects (75 males/27 females)), rice labourers (63 subjects (42 males/21 females)) and the general population (129 subjects (46 males/83 females)).

IgG antibodies were detected using the ELISA qualitative technique with *Leptospira* spp. antigens (SERION ELISA classic Leptospira IgG®, Würzburg, Germany). Positive samples were confirmed by microscopic agglutination test. Live *Leptospira* from the following serogroups were used as antigens: *bratislava, canicola, grippotyphosa, hardjo* and *pomona.* SPSS Statistics 22 software was used for statistical studies.

Two hundred and seventy-eight samples (94.6%) were negative (Table 1), with antibodies against *Leptospira* spp. being detected in 16 (5.4%). The highest seroprevalence (p 0.016) was found among crayfish collectors (9.8%), followed by rice labourers (3.2%) and the general population (3.1%). All the positive samples presented antibody titres ≥1/50 against *Leptospira interrogans*, 15 of them (93.8%) also against the *icterohaemorrhagiae* serovar and 1 (6.2%) against *bratislava*. The principal risk factors for the presence of antibodies were occupation and sex. The risk was three times greater among crayfish collectors (OR 3.40; CI 95% 1.03–11.17; p 0.044) than in the general population, while no significant risk was found among rice labourers (OR 1.03; CI 95% 0.18–5.75; p 0.978). The risk of presenting antibodies was 13 times higher among men (OR 13.18; CI 95% 1.72–101.12; p 0.013) than among women. During

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Table 1
Serological results against *Leptospira* spp. by occupation

Occupation, *n* (%)	Global	Serology	
		Negative	Positive
	n = 294	278 (94.6)	16 (5.4)
Red swamp crayfish collectors	102 (34.7)	92 (90.2)	10 (9.8)
Rice labourers/Farmers	63 (21.4)	61 (96.2)	2 (3.2)
General population[a]	129 (43.9)	125 (96.9)	4 (3.1)
Red swamp crayfish handlers	40 (13.6)	39 (97.5)	1 (2.5)
Other occupations	89 (30.3)	86 (96.6)	3 (3.4)

[a] This table differentiates between the general population and the rice labourer population in order to determine whether the latter subgroup is more susceptible or less susceptible to leptospirosis infection than red swamp crayfish collectors or than the general population itself.

the study period and in the following year, 16 cases of leptospirosis were diagnosed: 15 men and one woman, representing a cumulative incidence of 118.42/100 000.

Seroprevalence against *Leptospira* spp. (5.4%) and leptospirosis incidence (118.42/100 000 inhabitants) are much higher than those found in other Spanish studies in neighbouring cities with similar climates, and also than those found in other European studies [2,3].

Dastis-Bendala et al. [2] highlighted activities associated with stagnant water as a risk factor for infection and were the first to identify red swamp crayfish collectors as a risk population and they found seroprevalences of 62.7% in crayfish collectors and 30.3% in rice labourers. In our study, the figures were 9.8% and 3.1%, respectively, although if we take into account the fact that one of the rice labourers with *Leptospira* spp. antibodies reported that he also collected crayfish in his spare time, our result for seroprevalence among crayfish collectors rises to 10.7% and that for rice labourers drops to 1.6%, a value lower than that of the general population.

These differences are attributable to a considerable increase in the use of mechanical resources in rice cultivation in the period separating the two studies, while the high rates currently found among crayfish collectors is mainly due to the non-use of personal protective equipment and the non-adoption of recommended hygiene precautions, such as washing one's hands before and after collecting.

This study demonstrates the existence of a statistically significant difference in leptospirosis prevalence between the sexes, with men presenting a higher rate. This concurs with the findings of other authors [4,5].

Strategies for preventing leptospirosis should be based on an understanding of the illness's local epidemiology and the mechanisms by which it is transmitted. This study shows that an occupation like red swamp crayfish collecting in a temperate climate zone with a high rodent population is a risk factor for *Leptospira* spp. infection, even when compared with other similar activities in the same environment.

Although from a global perspective human leptospirosis is closely linked to poverty and living conditions, the only social variable we found the illness to be associated with in our study was occupation.

Transparency declaration

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