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Spatial Analysis Of Small Ruminant Brucellosis Occurrence In Trás-Os-Montes And Alto Douro (Portugal, 2010-2014)

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Introduction: Small ruminant brucellosis (SRB) is a zoonotic disease caused by *Brucella melitensis* responsible for economic losses from decreased productivity and lost trade in endemic regions. Although an ongoing national official disease control program is implemented, the efforts in eradicating the disease in Trás-os-Montes and Alto Douro, a region in Northeast of Portugal have not so far been successful, particularly in effectively eliminate new herds infection. Our aim is to analyse the spatial distribution of the prevalence and incidence at herd level of SRB and assess potential risk factors associated with the incidence using data of the control campaigns undertaken between 2010 and 2014.

Methods: From the Portuguese database PISA.net we selected all herds registered and enrolled in the special SRB eradication program in the regional administrative food and animal health services of Bragança, Chaves-Mirandela and Vila Real-Douro Sul, excluding the herds from the municipality of Mondim de Basto in Vila Real district due to lack of accessible information. A spatial regression model, using the Poisson distribution, was used to quantify the Relative Risk (RR) of SRB. Spatial autocorrelation of the prevalence and incidence of SRB at village level was assessed using Global Moran's I (GMI) and local clusters were identified using Local Moran's I (LMI) as a LISA.

Results: A spatial heterogeneity of the distribution of positive and infected herds was observed with clustering of villages of the study area. The incidence (new cases) of infected herds is widespread and there is not a cluster distribution pattern, except for 2013 (GMI=0.004, p-value=0.045), but prevalence was clustered during the five years. Furthermore, we found no significant association between clusters of high risk of prevalence and incident villages. The odds of brucellosis was significantly higher in large herd size (OR_{adj} 1.006 and 95% CI 1.005-1.007) and lower through the years (OR_{adj} 0.793 and 95% CI 0.729-0.863).

Conclusion: SRB herd prevalence varied significantly within villages in Trás-os-Montes and Alto Douro between 2010-2014. While annual herd prevalence is clustered in certain villages, annual herd incidence by villages seems to be randomly distributed across the region (the exception is 2013). These distinct patterns suggest difference in risk factors for the two measures. And may contribute to clarify the question whether the direct contact between flocks or the sharing of pastures play a determinant role in dissemination of the disease in the region. Additionally, the risk of infection was higher as herds increase in size and lowered as years pass by. This latter finding was expected, as a result of the eradication program applied in the region of study.