Seroprevalence of Borrelia burgdorferi in horses in the southern part of Belgium: a "one health" driven study

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Objectives

Lyme borreliosis is the most prevalent tick-borne infection in the northern hemisphere affecting both humans and animals including horses. The complex interactions between the pathogen, *Borrelia burgdorferi spp* , the vector, mainly *Ixodes ricinus* in Europe and the widespread range of hosts, as well as the impact of several climatic and non-climatic factors affecting these interactions support the necessity of interdisciplinary collaboration for surveillance and prevention. Because humans and horses commonly share the same habitat the epidemiological data collected in horses can be potentially useful for assessing risk factors for human borreliosis. Unfortunately, the lack of specific symptoms in horses makes diagnosis a challenging task for veterinarians. Antibody testing is for these reasons a valuable tool but must be interpreted with caution.

The objective of our study was to provide accurate data concerning the prevalence of *Borrelia burgdorferi sensu lato* antibodies in horses living in the Southern part of Belgium as well as to assess diagnostic value of the commonly used serological tests (IF and ELISA) in order to promote critical interpretation of positive test results. An invalid diagnosis of Lyme disease will indeed have negative consequences for the horse as well as for public health regarding to the threat this represents for antibiotic resistance. By arguing for an adapted use and interpretation of serologic tests we intended to promote rational use of antibiotics.

Methods

To achieve our objective we conducted three complementary studies. We conducted a prevalence study on a sample of 303 serums collected between April 2014 and April 2016 from horses living in Wallonia who hadn't presented any clinical symptom suggestive of Lyme disease in the past 12 months. Secondly we assessed the diagnostic value of the two most commonly used serologic tests ELISA and IF, by comparing the test results of 100 serums with the results of a western blot test, used for the purpose as reference standard. In the third part we evaluated the impact of 4 different diagnostic strategies and evaluated the outcome with emphasize on preventing unnecessary use of antibiotics (cost-benefit analysis).

Results

A seroprevalence of 22% was observed in our sample with an evidence of age related effect (p-value=0.02) on the presence of *Borrelia burgdorferi* antibodies. When evaluating diagnostic value of serological tests we could observe that IF and ELISA tests both perform well regarding to sensitivity and are adapted tests when used as first step testing. Their specificity is too low to be able to be confident in the positive testresultsand so ELISA and IF are not adapted to be used alone to confirm Lyme disease in horses. A second more specific test (western blot) is necessary to confirm the positive results. With regard to rational use of antibiotics we could observe a possible decrease ranging from 17 to 47% of non-appropriate antibiotic use when choosing for a two-step strategy compared to the use of a single serology.

Conclusion

This study argues for a necessary change in the management of horses suspected of Lyme disease. Taking in account the epidemiologic datas of seroprevalence in Wallonia, as well as the diagnostic values of the two most commonly used serologic tests we illustrated the urgent need to convince veterinary practitioners to confirm the positive results of *Borrelia burgdorferi* before administration of antibiotic treatment.

This study on Lyme disease is thus an example of a "one health" driven study.