



Organizer

**UNIVERSITY of NOVI SAD  
FACULTY of AGRICULTURE  
21000 Novi Sad, Serbia**



Co-Organizers



**SLOVAK UNIVERSITY of AGRICULTURE, NITRA  
FACULTY of BIOTECHNOLOGY and FOOD SCIENCES**



**ANIMAL PRODUCTION  
RESEARCH CENTRE  
NITRA, SLOVAK REPUBLIC**



**BANAT UNIVERSITY of AGRICULTURAL  
SCIENCES and VETERINARY MEDICINE  
TIMISOARA, ROMANIA**

**23<sup>rd</sup> International Symposium**

**»NEW TECHNOLOGIES INCONTEMPORARY ANIMAL PRODUCTION«**

***PROCEEDINGS***



***Novi Sad, Serbia, June 19 – 21, 2013.***

---

**Sponsors:**

Ministry of Trade, Agriculture, Forestry and Water Management  
Ministry of Education and Science  
Provincial Secretariat for Science and Technological Development  
Provincial Secretariat of Agriculture, Water Management and Forestry  
Provincial Secretariat of Education

**Honorary Board****Prof. dr Miroslav Vesković**

Rector of University of Novi Sad

**Prof. dr Žarko Obradović**

Minister of Education and Science

**Goran Knežević**

Minister of Agriculture, Forestry and Water Management

**Prof. dr Dragoslav Petrović**

Provincial Secretary of Science and Technological Development

**Goran Ješić**

Provincial Secretary of Agriculture, Water Management and Forestry

**Prof. dr Milica Petrović**

Dean of Faculty of Agriculture in Belgrade-Zemun

**Doc. dr Aleksandar Ostojić**

Dean of Faculty of Agriculture in Banja Luka

**Prof. dr Refik Šahinović**

Faculty of Biotechnology in Bihać, Rector of University of Bihać

**Natalija Perović**

Faculty of Biotechnology, Podgorica

**Dr Miloš Lukić**

Director of Institute of Animal Husbandry, Belgrade - Zemun

**Dr Dragica Stojanović**

Institute of Veterinary, Novi Sad

**Dr IvetićVojin**

Institute of Veterinary of Serbia, Beograd

**Dr Grgo Tikvicki**

President of Veterinary Chamber of Serbia, Beograd

**Organizing Board:**

**Prof. dr Milan Popović**, President (Serbia)  
**Prof. ing. Jan Tomaš, CSc.**, Vice President (Slovak Republic)  
**Mgr Dana Peškovičová, PhD** (Slovak Republic)  
**Prof. ing. Paul Pişan, DSc** (Romania)  
**Prof. dr Dragan Glamović** (Serbia)  
**Prof. dr Branislav Lako** (Serbia)  
**Prof. dr Snežana Trivunović** (Serbia)  
**Doc. dr Igor Jajić** (Serbia)  
**Prof. dr Dragan Žikić** (Serbia)  
**Mr Srđan Ljubičić**, Secretary (Serbia)

**Scientific Board:**

**Prof. dr Blagoje Stančić**, President  
**Prof. dr Norbert Lukač** (Slovakia), Vice President  
**Prof. dr Milenko Stevančević**  
**Prof. dr Lidija Perić**  
**Dr Robin Anderson** (USA)  
**Prof. dr Milan Marković** (Montenegro)  
**Prof. dr Janez Salobir** (Slovenia)  
**Prof. dr Gunnar Klemetsdal** (Norway)  
**Prof. dr Boris Stegnyi** (Ukraine)  
**Prof. dr Sandor Kukovics** (Hungary)  
**Prof. dr Jasmina Havranek** (Croatia)  
**Prof. dr Bone Palaševski** (Macedonia)  
**Prof. dr Gjoko Bunevski** (Macedonia)  
**Prof. dr Stoja Jotanović** (Bosnia and Herzegovina)  
**Doc. dr Mirjana Đukić Stojčić**, Secretary  
**Dr Ivana Davidov**, Assistant, Secretary

**Editor in chief**

Prof. dr Milan Popović, Dean, Faculty of Agriculture, Novi Sad, Serbia.

**Publisher**

Faculty of Agriculture, Trg Dositeja Obradovića 8, 21000 Novi Sad, Serbia.  
Phone: +381 21 485-3500; <http://polj.uns.ac.rs/>

**Printing**

“Feljton” Novi Sad, Stražilovska 17.

## FINDINGS OF SPECIFIC ANTIBODIES AGAINST BORRELIA BURGODRFERI IN HORSES\*

Savić, S., Vidić, B., Lupulović, D., Grgić, Ž., Medić, S.<sup>1</sup>

**SUMMARY:** Lyme borreliosis is a disease caused with bacteria *Borrelia burgdorferi*. This disease is one of the most numerous and most widespread disease among all vector borne diseases in our country and it is also one of the emergent diseases and zoonoses. During 2011. and 2012. blood samples were collected from horses in different stables and different owners in middle and northern parts of Serbia (Pančevo, Beograd, Vršac, Surduk, Zobnatica, Kelebija, Karađorđevo, Subotica, Bečej, Pećinci, Šabac, Ruma, Temerin, Kač). In all of these municipalities the presence of Lyme disease vectors have been previously found, the *I. ricinus* ticks. Veterinarians in these loctions are aware of he existance of the disease in clinical form, but no analysis has been done so far, on the seroprevalence in horses.

In total, 176 blood samples have been collected, from horses of different gender, age, breed and purpose of use. All of the horses were without any clinical symptoms that could indicate lyme disease. All of the samples were analysed to the pressence of specific antibodies against *Borrelia burgdorferi* with comercial diagnostic ELISA test (enzyme-linked immunosorbent assay), produced by Euroclone, Italy. The presence of different antibody levels to specific antibodies against *Borrelia burgdorferi* was found in 33 horses total (18,75%). In 18 horses the findings were suspicious (10,22%), and in 15 horses (8,52%) the findidngs were positive to the presence of antibodies against *Borrelia burgdorferi*. These results show that 18,75% of horses were disposed to some kind of an influence of *B. burgdorferi* in the region where vector of lyme borreliosis *I. ricinus* is present.

Key words: Lyme borreliosis, vector borne, seroprevalence, horses

### Introduction

Lyme borreliosis is a disease caused with bacteria *Borrelia burgdorferi*. It is a vector borne, emergent, infectious and zoonotic disease of animals and humans. When an infectious disease that was thought to be eradicated previously and totally under control, appears again, it is called emergent infectious disease. Zoonoses are infectious diseases which in natural circumstances can be transferred from animals to humans. Out of numerous emergent diseases, 60-70% of them are considered zoonotic. Vector-borne diseases are the ones for which in order to transfer the disease from animal to animal or human, vectors are needed. Lyme disease is one of the most numerous and most widespread disease among all vector borne diseases in our country and it is also an emergent disease and zoonoses. It is a multisystemic disease in subacute or chronic form and it can be manifested with changes in skin, joints, heart, nervous system, eyes, etc. The disease is unpredictable with possible recurrences and chronic form. Lyme disease can be found in Nort America, Europe, Asia, Australia and North Africa [7, 3].

Lyme disease is caused with spiral gram negative bacteria from the genus of *Borrelia*. Within the group of *Borrelia burgdorferi sensu lato* there are over 10 different genospecies of *Borrelia*, and some of them can cause a disease. In Europe the most frequent causative agents for Lyme disease are *B. afzelii*, *B. garinii* and *B. burgdorferi sensu stricto*. The vector for transmission of the disease is a tick. In Europe, it is most frequently *Ixodes ricinus*.

Clinical symptoms in horses are lethargy, mild fever, swollen and stiff distal joints. Sometimes neurological symptoms can be seen. Perhaps the most frequently reported clinical sign in this grouping is arthritis. Arthritis that results from Lyme disease can involve one or several joints. The arthritis is often episodic, but can also become chronic [1]. Joints of the forelimb seem to be affected most frequently and are often painful, warm, and swollen. Lameness and joint swellings occur frequently in horses, and they can be from a variety of causes. The clinical symptoms are often nonspecific and alike to some other diseases [10]. Thus, the veterinarian first would eliminate these potential causes before turning attention to Lyme disease. Also, a variety of other maladies have been associated with Lyme disease to further confuse the issue – encephalitis with paralysis of a tail, difficulty swallowing, sweating, and wandering. On the other hand, heart, liver, and kidney diseases that have been reported in humans as a result of Lyme disease have not been seen in horses [6].

Diagnostic procedure for Lyme disease is complex for all the animal species and humans also. It is difficult to give a definite diagnosis in horses [2]. As already mentioned before, there is a variety of the clinical signs: lameness, arthritis, neurologic disease, eye disease, and dermatitis. For diagnosis blood test is needed. The blood test is based on detecting antibodies to the infectious bacteria. Unfortunately false negative results can occur if a horse is tested

---

<sup>1</sup> Sara Savić, Branka Vidić, Diana Lupulović, Živoslav Grgić: Naučni institut za veterinarstvo „Novi Sad“, Rumenački put 20, Novi Sad, Serbia. Strahinja Medić, Veterinarska laboratorija za kliničku dijagnostiku „VetLab“, Živka Davidovića 30, Beograd

Corresponding author: Sara Savić, sara@niv.ns.ac.rs

\* This study was supported by grant TR31084 from Serbian Ministry of Education, Science and technological development.

during the first several weeks of infection before antibodies have developed. There are other tests that have been developed like Western blot, or ones based on molecular technique (PCR), but they are not widely available. For diagnosis it is also important if a horse live in a tick-infested area where Lyme disease has been reported in humans or dogs [8].

When the diagnosis of Lyme disease is confirmed, the treatment protocol will include antibiotics, tetracyclines and ampicillin have been used successful. However, if the disease is in an advanced stage, prolonged treatment might be required.

Prognosis of Lyme disease depends on the stage of the disease and on the beginning of a therapy. If the disease is not treated, a chronic form can be developed with malfunction of different organs and frequent recurrence. Luckily, horses do not appear to be as susceptible to the disease as people and dogs.

### Material and Method

During 2011. and 2012. blood samples were collected from horses in different stables and different owners in middle and northern parts of Serbia (Pančevo, Beograd, Vršac, Surduk, Zobnatica, Kelebija, Karadordevo, Subotica, Bečej, Pećinci, Šabac, Ruma, Temerin, Kač). In all of these municipalities the presence of Lyme disease vectors have been previously found - the *I. ricinus* ticks. In some of the municipalities, a study has been previously done on the prevalence of *B. burgdorferi* in *Ixodes ricinus* ticks.

In total, 176 blood samples have been collected, from horses of different gender, age, breed and purpose of use. All of the horses were without any clinical symptoms that could indicate Lyme disease. All of the samples were analysed to the presence of specific antibodies against *Borrelia burgdorferi* with commercial diagnostic ELISA test (enzyme-linked immunosorbent assay), produced by Euroclone, Italy.

### Results and Discussion

In the region where study on horses was done, previously, were done several studies on the existence of ticks as vectors and the prevalence of *B. burgdorferi* in ticks *Ixodes ricinus* as vectors of the disease. It was found that the majority of tick are of the *Ixodes ricinus* species (over 60%). Also, in some regions, in over 25% of *I. ricinus* ticks, *B. burgdorferi* was found [4, 5, 9]. In these regions Lyme disease in humans and dogs was already reported [9, 12].

The analysis was done on 176 blood serum samples of horses. The presence of different antibody levels to specific antibodies against *Borrelia burgdorferi* was found in 33 horses total (18,75%). In 18 horses the findings were suspicious (10,22%), and in 15 horses (8,52%) the findings were positive to the presence of antibodies against *Borrelia burgdorferi*. These results show that 18,75% of horses were disposed to some kind of an influence of *B. burgdorferi* in the region where vector of Lyme borreliosis *I. ricinus* is present and where the disease exists among humans and dogs.

### Conclusion

Veterinarians in these locations are aware of the existence of the disease in clinical form, but no analysis has been done so far, on the seroprevalence in horses. For the Lyme disease to occur in horses, beside vectors and infectious agent, some other factor are needed. Since Lyme disease is an emergent disease, factors of emergency are needed. Ecological changes (floods, droughts), climate changes, with the consequences of economic development and land use (afforestation or cut down of forests), changes in demography and humans behaviour – increase of population, migrations from rural to urban regions, tourism, etc are all factors that can contribute to the occurrence of Lyme disease in general (Stevanović et al, 2011). Positive serology finding in a horse is insufficient for a definite diagnosis on Lyme disease in horses. It can only represent the possibility of an infection with *B. burgdorferi* at some point. It does not mean that horse will become ill at some point for sure. Positive serology finding only mean that horse has been in contact with *B. burgdorferi* and the antibodies are formed. A horse may never develop clinical signs of the disease. But in case that clinical symptoms do occur, together with positive serology finding for specific antibodies against *B. burgdorferi*, that is enough for a diagnosis for Lyme disease and an indication for treatment.

For horse owners in endemic areas, prevention is very important. Ticks do not transmit the spirochete immediately after the attachment, at least 24 hours are needed. The most effective preventive measure is to examine horses on a daily basis and remove ticks immediately. Nymphs can be difficult to locate because of their size. Ticks can be found about anywhere on a horse's body, but most frequently along the neck at the base of the mane and around the rectal area. Removing ticks has also to be done with caution, without squeezing or chemicals, so that material from the tick would not be forced into the skin. Ticks can be examined in a laboratory, for the presence of *Borrelia*.

### References

- [1] Cohen N.D. Equine veterinary education, 1996, 8, (4), 213-215.;
- [2] Gall Yvonne, Pfister Kurt: International Journal of Medical Microbiology 296 (2006), S1, 274-279.;
- [3] Hahn Caroline, Mayhew I.G, Whitwell Katherine E, Smith K.C, Carey Dorothy, Carter S.D, Read R.A.: Equine veterinary journal, 1996, 28, (1), 84-88.;
- [4] Jurišić A.,

Petrović A., Savić-Jevđenić S., Grgić Ž., Rajković D.: . Simpozijum entomologa Srbije 2007, Užice, 26-30. septembar 2007, Plenarni referati i rezimeji, str. 9, Užice, Entomološko društvo Srbije.; [5] Jurišić A., Rajković D., Petrović A., Savić-Jevđenić S., Grgić Ž.: .VII savetovanje o zaštiti bilja, Soko Banja, 15-18. novembar 2005. godine, Zbornik rezimea, Str. 194, Beograd, Društvo za zaštitu bilja Srbije.; [6] Les Sellnow, . The Horse - your giude to equine health care, 2000, JUL 01.; [7] Metcalf Kathryn, Lilley Caroline S, Revenaugh M.S, Glaser Amy L, Matcalf Elisabeth S. Journal of equine veterinary science, 2008, Vol 28, no 10, 587-589.; [8] Savić S., Vidić B., Grgić Ž., Jurišić A., Čurčić V., Ružić M., Lolić Z.: . Arhiv veterinarske medicine, 2012, ISSN 1820-9955, Str. 77-87.; [9] Savić S., Vidić B., Lazić S., Lako B., Potkonjak A., Lepšanović Z. Serbia. Parasite, 2010, ISSN 1252-607X, str. 357-361.; [10] Savić-Jevđenić S., Grgić Ž., Vidić B., Petrović A.: Biotechnology in animal husbandry, 2007, ISSN 1450-9156, str.215-221., [11] Stevanović V, Starešina V, Barbić Lj, Milas Z, Štrifof Zrinka, Habuš Josipa, Turk N. 2011, Veterinarska stanica 42 (3).; [12] Šeguljev Z., Vidić B., Ilić S., Savić S., Petrović V.: Second International epizootiology Symposium [i] XIV Serbian epizootiology days, April 18-21, 2012, Belgrade, Proceedings, Str. 167-174.