EMERGING VECTOR BORNE DISEASES – RISK FOR PUBLIC HEALTH

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Abstract: In the past vector borne diseases represented a major public health concern in most tropical and subtropical areas, but today they are an emerging threat for continental and developed countries. Vector borne zoonotic diseases occur when vectors, animal hosts, pathogens and susceptible human population exist at the same time, at the same place. Global climate change is predicted to lead to an increase in vector borne infectious diseases and disease outbreaks. It could affect the range and population of pathogens, host and vectors, transmission season, etc. Reliable surveillance for diseases that are most likely to emerge is required. It is expected from veterinarians to play a fundamental role in first of all prevention and then treatment of vector borne diseases in dogs. Canine vector borne diseases represent a complex group of diseases including anaplasmosis, babesiosis, bartonellosis, borreliosis, dirofilariosis, erlichiosis, leishmaniosis. Some of these diseases cause serious clinical symptoms in dogs and some of them have a zoonotic potential with an effect to public health. During a four year period, from 2009-2012, a total number of 236 dog samples were analysed for vector borne diseases (borreliosis, dirofilariosis and leishmaniasis) in routine laboratory work. The analysis were done by serological tests – ELISA for borreliosis, dirofilariosis and leishmaniasis and modified Knott test for dirofilariosis. This number of samples represented 52.91% of total number of samples that were sent for analysis for different infectious diseases in dogs. Annually, on average half of the samples brought to the laboratory to analysis for different infectious diseases are analysed for vector borne diseases. In the region of Vojvodina, the following vector borne infectious diseases have been found so far in dogs: borreliosis, dirofilariosis, leishmaniasis, erlichiosis and anaplasmosis.

Key words: vector borne diseases, public health, dog, ELISA
Introduction

In the past vector borne diseases represented a major public health concern in most tropical and subtropical areas, but today they are an emerging threat for continental and developed countries. There are countries where environmental conditions are not so favorable to certain vector populations, but immigration allows them to persist (Rascolau, 2012). The complex epidemiology of vector-borne diseases creates significant challenges in the design and delivery of prevention and control strategies, especially in light of rapid social and environmental changes. Many diseases are spatially constrained, for example vector-borne and zoonotic diseases occur where and when vectors, animal hosts, pathogens and susceptible human populations overlap (Hongoh et al, 2011). Global climate changes is predicted to lead to an increase of infectious disease outbreaks. Reliable surveillance for diseases that are most likely to emerge is required. Climate changes could affect the range and population size of pathogens, hosts and vectors, the length of the transmission season and the timing and persistence of outbreaks (Greer and Fisman, 2008). If there is an appearance of infectious diseases that are considered to be eradicated from before or that are totally under control, they are called emergent infectious diseases (Morse 1991). Emerging infectious diseases can be defined as infections that have newly appeared in a population, or are rapidly increasing in incidence or geographic range. Many of these diseases are zoonoses (Morse, 2004). From all the causative agents of emergent infectious diseases, 60-70% of them have a zoonotic potential (Taylor et al., 2001). Zoonoses are infectious diseases which can be transferred from animals (mammals) to humans. Vector-borne zoonotic diseases occur when vectors, animal hosts, pathogens and susceptible human populations exist at the same time, at the same place. Maps of expected distributions of vector existence are often presented as a risk to exposure to a pathogen. Global climate change is predicted to lead to an increase in vectorborne infectious diseases and disease outbreaks. It could affect the range and population of pathogens, host and vectors, transmission season, etc. Reliable surveillance for diseases that are most likely to emerge is required.

The factors of emergence are the following: changes in ecology, changes in demography and human behaviour, changes and adaptations of microorganisms, improvement in technology and changes in industry, international transport and trade and in compliance of public health measures (Stevanović et al, 2011). Changes in ecosystem may lead to increase of population in natural hosts, or vectors for certain emergent infectious disease. These factors are becoming increasingly prevalent, suggesting that infections will continue to emerge and probably increase. Strategies for dealing with this problem include focusing attention on promoting disease emergence, especially in situations when animals...
and humans are in contact and implementation of effective disease surveillance and control \cite{Morse2004}.

For practicing veterinarians, vector borne diseases represent a constant challenge. The health of companion animals never played a more important role in a family life. It is expected from veterinarians to play a fundamental role in first of all prevention and then treatment of vector borne diseases in dogs. Canine vector borne diseases represent a complex group of diseases including anaplasmosis, babesiosis, bartonellosis, borreliosis, dirofilariosis, erlichiosis, leishmaniosis, rickettsiosis. Some of these diseases cause serious clinical symptoms in dogs and some of them have a zoonotic potential with an effect to public health.

A tick species I. ricinus is usually predominant among ticks originating from erbi and is one of the most widely distributed. A significant presence of B. burgdorferi sensu lato was detected in I. ricinus ticks from Serbia, using dark field microscopy \cite{Milutinovic2006, Milutinovic2002}.

**Material and methods**

During a four year period, from 2009-2012, a total number of 446 dog samples were analysed for different zoonotic diseases. For vector borne diseases (borreliosis, dirofilariosis and leishmaniasis) 236 dog blood samples were analysed in routine laboratory work, which makes 52.91% of total samples analysed for infectious diseases. The analysis were done by serological tests – ELISA for borreliosis (Microgen IgG and IgM and Euroclone commercial ELISA set kits for detection of specific antibodies against *Borrelia*), leishmaniosis (Euroclone commercial ELSA set kit for detection of specific antibodies against *Leishmania*) and dirofilariosis (IDEXX commercial ELISA set kit for detection of specific antibodies against *Dirofilaria*). The procedure of analysis was done by the original manufacturer’s instructions. Diagnostic of dirofilariosis was also done with modified Knott test for dirofilariosis. The samples were collected when dogs came for a routine check-up, or when they were sent for a certain disease detection because of the clinical symptoms that could be found in the animal. Some of the dogs had clinical symptoms which could be identified as characteristic for borreliosis, leishmaniosis or dirofilariosis. For borreliosis 117 dog blood samples were examined, for dirofilariosis 31 sample and the examined number of samples for leishmaniosis was 88.

**Results and Discussion**

The number of samples analysed for vector borne zoonoses: borreliosis, leishmaniosis and dirofilariosis represented 52% of total number of samples that
were sent for analysis for different infectious diseases. Annually, on average half of the samples brought to the laboratory to analysis for different infectious diseases are analysed for vector borne diseases. In the region of Vojvodina (northern part of Serbia), the following vector borne infectious diseases have been found so far in dogs: borreliosis, dirofilariosis, leishmaniasis, erlichiosis and anaplasmosis. For erlichiosis and anaplasmosis a routine diagnostic procedure started only in 2012, so the number of these samples was not taken into the consideration during the study.

In the same region the following diseases have been diagnosed in humans, so far: borreliosis, dirofilariosis and leishmaniosis (imported cases). Borreliosis exists as a common disease in humans in Serbia. Several cases of dirofilariosis in humans have been found during the last four years in Vojvodina and also cases of leishmaniosis have been found during the same period, but only as imported cases.

During the observed period (2009-2012), 117 dogs were examined for lyme borreliosis in routine work and 17 of them were found positive (14.53%). Seroprevalence for lyme borreliosis in dogs was studied previously, for the earlier three year period (2006-2008) in a larger number of samples, and in the same region and it was found to be 25.81%. Also, the prevalence of lyme borreliosis in ticks in the northern part of Serbia, was found to be 22.12%, depending on the region (Savić et al, 2010). In a study from Milutinovic et al, the highest prevalence rate found in Serbia among ticks for B.burgdorferi sensu lato was 42.5%. The presence of five B.burgdorferi sensu lato genospecies was found: B. burgdorferi sensu stricto, B. afzelii, B. garinii, B. usitaniae and B. valaisiana. Also co-infections were found in ticks with B. burgdorferi sensu lato and A. phagocytophilum (Milutinović et al., 2008).

During the same period from 2009-2012, the number of 31 dogs were examined for dirofilariosis – with or without clinical symptoms, and in 16.1% the presence of microfilaria or specific antibodies against dirofilaria was detected. In the previous period a study was done on working and military dogs in the same region, where as a result a seroprevalence for dirofilariosis was found to be 18% (Pajković et al, 2010).

The number of examined dog blood samples for leishmaniosis, during the period of study, was 88. The number of positive samples detected for leishmaniosis was 6, which is 6.81%. A certain number of dogs was taken abroad in the previous period and were examined upon return to the country (the number of examined dogs was 21) for the presence of specific antibodies against Leishmania. The dogs were taken abroad (Italy, Greece or Montenegro) for a certain period of time (1 week – several months). From the total of 21 samples, in 28.57% a positive findings for leishmaniosis was detected and some of the dogs had clinical symptoms of leishmaniosis (Savić et al., 2012).
Conclusion

Human and animal health is connected today into a One health concept, which focuses on zoonotic pathogens emerging from wildlife, domestic animals and companion animals. A role of companion animals influence to public health is more important over the years, especially the major vector borne infectious diseases that are shared by humans and dog or cats. There should be an interaction between veterinary and human medicine for the benefit of domestic, wild animal and human health. It should always be in our minds that there is an interaction between human and domestic animal and wildlife health with global zoonotic disease pandemics and emerging infectious diseases which came from these animal species. From the total of 446 dogs examined for different infectious diseases, 236 of them were tested for vector borne diseases that exist in the region in dogs, vectors and humans. For one of the three studied diseases, in total 28 positive samples were found, which is 6.28%.

Leishmaniosis, borreliosis, erlichiosis, anaplasmosis, etc are considered as major vector borne infectious diseases that are shared by man and dogs, from the One health concept point of view. There should be an interaction between veterinarian and human medicine, with clinicians, researchers and government working together for the benefit of domestic, wild animal and human health and the global environment (Day, 2011).

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Emergentne vektorske bolesti – rizik za javno zdravlje

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Rezime

Nekada su vektor prenosive bolesti predstavljale veliki problem za javno zdravlje u većini tropskih i subtropskih zemalja, a danas predstavljaju emergentnu pretnju za kontinentalne i razvijene zemlje. Vektor prenosive zoonozne bolesti se javljaju kada se u isto vreme nadu na istom mestu vektori oboljenja, životinje domaćini, uzročnik i prijemčiva ljudska populacija. Globalne klimatske promene
utiču na porast vektor prenosivih infektivnih oboljenja i pojavu epidemija. Mogu da utiču na populaciju uzročnika, domaćina i vektora, sezonu prenošenja, itd. Potrebna je pouzdan nadzor nad bolestima za koje postoji najveća verovatnoća da se pojave.

Od veterinara se očekuje da preuzmu glavnu ulogu u najpre u prevenciji a onda i tokom terapije vektor prenosivih bolesti kod pasa. Vektor prenosive bolesti kod pasa predstavlja grupu oboljenja: anaplazmozu, babeziozu, bartonelozu, boreliozu, dirofilariozu, erlihiozu, lajšmaniozu. Neke od ovih bolesti izazivaju ozbiljne kliničke simptome kod pasa, a neke imaju i zoonotski karakter, a time i uticaj na javno zdravlje.

Tokom četrugodišnjeg perioda od 2009.-2012. godine, pregledano je ukupno 236 uzoraka krvi pasa na vektor prenosive bolesti (boreliozu, dirofilariozu, i lajšmaniozu), tokom rutinskog dijagnostičkog rada. Analize su rađene serološkim testovima – ELISA za boreliozu, dirofilariozu i lajšmaniozu i modifikovan Knotov test za dirofilariozu. Ovaj broj uzoraka koji je ispitivan na prisustvo vektor prenosivih bolesti je predstavljao 52,91% od ukupnog broja uzoraka pasa koji su poslali na ispitivanje na različite infektivne bolesti. Tokom godine, u proseku polovina uzoraka koji se donose na analizu na različite infektivne bolesti se pregledaju na vektor prenosive bolesti. Na području Vojvodine, sledeće vektor prenosive bolesti su dijagnostikovane do sada kod pasa: boreliioza, dirofilarioza, lajšmanioza, erlihioza i anaplazmoza.

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