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Letter to the editor

CONSENSUS STATEMENT ON THE EPIDEMIOLOGICAL SITUATION AND EXPECTED FREQUENCY OF CANINE VECTOR-BORNE DISEASES IN SERBIA

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Statement

The current issue of Veterinarski Glasnik (Vol 74, No 2) is dedicated to canine vector-borne pathogens (VBP) and vector-borne diseases (VBD) in Serbia. All published reviews and original papers indicate the amount of research done in Serbia and the amount of collected and analysed data is high for the majority of topics, inviting us to summarise all the findings in a consensus statement that we hope will be of importance for practitioners who are in constant contact with dogs in Serbia and for researchers who should continue to develop this field of investigation.

For every VBP/VBD, the following data were retrieved mainly from articles published in this issue of Veterinarski Glasnik, and Table 1 was created based on the epidemiological situation, (sero)prevalence, and classification of the risk areas.

1. The epidemiological situation was defined using a modified framework developed by Braks et al. (2011):
   a. Local transmission – autochthonous cases occurred every year (frequent) or sporadically (rare).
   b. Pathogen was detected and described in hosts (dogs) and/or vectors.
   c. Vector was detected and described.

The presence of the VBP in a competent vector is a prerequisite to expect the possible local transmission and infection of dogs. For the minority of selected pathogens, this feature is not yet confirmed. The information about autochthonous clinical cases was retrieved from peer-reviewed articles in all but one case: an autochthonous *Leishmania* spp. case in a dog (Bekvalac and Fenjac, 2016) was published in a SASAP bulletin – designed for continuing education of veterinary practitioners in Serbia. Also, the presence of *Leishmania* spp. in wild canids was taken into consideration as proof the pathogen is already autochthonous (Ćirović et al., 2014). Similarly, a high prevalence (61.2%) of *Hepatozoon canis* in wild canids (red foxes) (Juwaid et al., 2019) was reported, while the expected frequency of clinical disease in dogs was estimated.

2. The data on (sero)prevalence were chosen to represent the whole range of available data, from the lowest to the highest percentage. These data vary according to the diagnostic assays used and geographical region of the country; we stress mainly the Northern and Southern Serbia regions have been investigated. For *Dirofilaria* spp., prevalence based on antigen detection was reported.
3. Classification of the risk areas. This classification is defined on a modified framework for classifying an area according to the present risk and other characteristics of disease transmission developed by Domanovic and Giesecke et al. (2012).
4. Finally, the possibility of encountering a specific VBD in dogs is estimated based on all previous data. We used four possible outcomes:
   a. Not expected – Pathogen and vector are not present; local transmission not recorded;
   b. Low – Local transmission not recorded, lack of data on pathogens and/or vectors, but seroreactive dogs are present;
   c. Intermediate – Rare local transmission (autochthonous clinical cases) of VBD is confirmed in Serbia, regardless of whether there is a lack of data on pathogens, vectors, and (sero)prevalence;
   d. High – Frequent local transmission of VBD is confirmed in Serbia, regardless of whether there is a lack of data on pathogens, vectors, and (sero)prevalence.

In conclusion, our knowledge on VBP/VBD has expanded in the last two decades, and veterinary service has improved due to the efforts of many colleagues. We would like to underline that the majority of existing data were collected from the Vojvodina or Belgrade regions, with a lack of information from other parts of Serbia. Thus, this statement should also be a starting point for more comprehensive and organised research in this field. We hope this consensus statement will help veterinarians in Serbia in the future management of their patients and direct research to fill the present gaps.

Table 1. The epidemiological situation, (sero)prevalence, classification of the risk areas and expected frequency of canine vector-borne diseases in Serbia. Data for the table were retrieved from original or review articles: [1]Bekvalac and Fenjac (2016); [2]Marčić et al., (2020); [3]Potkonjak and Žekić Stošić (2020); [4]Savić et al., (2020); [5]Spasojević-Kosić and Lalošević (2020); [6]Tasić et al., (2008); [7]Tasić-Otašević et al, (2020)

Pathogen	Epidemiological situation			(Sero)prevalence in (asymptomatic) dogs (%)	Classification of the risk areas	Expected frequency of clinical disease in dogs
	Local Transmission	Pathogen is present	Vector is present			
Anaplasma phagocytophilum[3]	NP	Yes	Yes	15.5 – 26.1	Imperilled	Low
Anaplasma platys[3]	NP	No	Yes	0.9	Predisposed	Low
Borrelia burgdorferi s.l.[3]	NP	Yes	Yes	0.07 – 26.1	Imperilled	Low
Babesia canis[3]	Frequent	Yes	Yes	11.7 – 32.8	Endemic	High
Babesia gibsoni[3]	Rare	Yes	Yes	1.8	Affected	Intermediate
Babesia vogeli[3]	Rare	Yes	Yes	13.5	Affected	Intermediate
Dirofilaria immitis[5]	Frequent	Yes	Yes	2.2 – 27.1	Endemic	High
Dirofilaria repens[4,6]	Frequent	Yes	Yes	2.89[4] – 49.2[6]	Endemic	High
Ehrlichia canis[3]	NP	No	Yes	0.0 – 16.0	Predisposed	Low
Ehrlichia ewingii[3]	NP	No	No	0.9	NA	Not expected
Ehrlichia chaffeensis[3]	NP	No	No	0.0	NA	Not expected
Haemotropic *mycoplasma*[3]	Rare	Yes	Yes	NP	Affected	Intermediate
Hepatozoon canis[3]	Rare	Yes	Yes	4.5	Affected	Low/Intermediate
Leishmania spp.	Rare[1]	Yes[1]	Yes	5.4[2]	Affected	Intermediate
Rickettsia conorii[3]	NP	No	Yes	44.8	Predisposed	Low
TBEV[3]	NP	Yes	Yes	17.5	Imperilled	Low
Thelazia callipeda[7]	Frequent	Yes	NP	NA	Affected	High

TBEV – Tick-borne encephalitis virus, NA – not applicable. NP – not published. Seroprevalence for asymptomatic dogs is indicated for all pathogens except for *D. immitis* and *D. repens* when the prevalence in asymptomatic and overt dogs is reported. Prevalence of *Hepatozoon canis* in asymptomatic dogs is reported.

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Authors' contributions

All authors read and approved the final manuscript.

Conflict of interest

The authors do not have any financial or personal conflicts of interest that could bias the study.

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