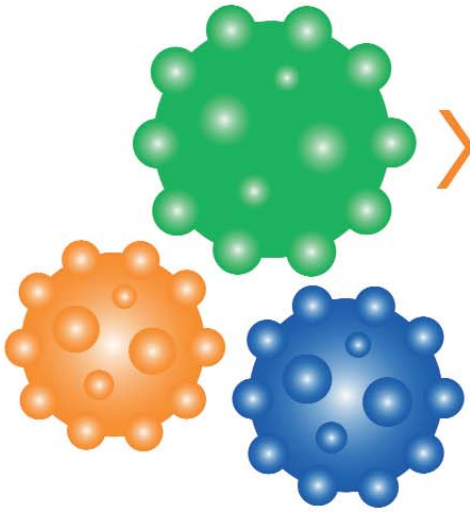

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Changing Viruses in a Changing World

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Conclusion: Our findings indicate high diversity of AstV detected in 6 different wild bird species. To elucidate relationships between wild bird AstV and domestic poultry AstV further surveillance is required.

Update on rabies situation in Serbia

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Objectives: Among all known zoonoses discovered so far, rabies is one of the oldest and still neglected fatal disease. According to WHO (2013), rabies takes every year more than 60.000 human lives and most of the victims are children under 15 years. The majority of human deaths occurred in developing countries of Asia and Africa. India has the highest recorded number of human victims, because of the huge population of stray dogs and inadequate vaccination programme. On the opposite site, many European countries are rabies-free and for these countries the main treat represents importation of rabid animals. In other countries, where Serbia belongs, rabies is maintained in the population of red foxes, which are the main reservoir of rabies virus in wildlife (WHO, 2013; Fooks et al., 2014).

The causative agent of rabies is RNA virus that belongs to the genus Lyssavirus, family Rhabdovirdae, order Mononegavirales. The reservoirs of rabies in Europe are different carnivores, while in North and Latin America bats are the main source of the disease. Rabies is transmitted by the bite of infected animal. Rabies is a neurotropic disease with clinical signs of encephalomyelitis and fatal outcome (Freuling et al., 2013).

After the World War II, rabies existed in former Yugoslavia in both urban and sylvatic form. Extensive veterinary measures and massive vaccination of dogs decreased the number of infected dogs and human exposure. Implementation of these measures resulted in progressive disappearance of urban rabies. The last report of human rabies case was recorded in 1980 (Petrovic, 1987; Aylan et al., 2011).

It is supposed that rabies entered Serbia in 1977 from the north, probably from Hungary, during the large enzootic emergency that spread in red foxes from Russia to Europe in 1940´s. Many researches and field trials have reported that the only effective way for rabies elimination in wild carnivores is oral rabies vaccination (ORV). The first country that implemented ORV of foxes in Europe was Switzerland in 1978, followed by many other countries (Pastoret and Brochier, 1998).

The objective of our study is to present rabies epizootiological situation in Serbia from 2006 to 2014. In 2010 was introduced the programme of ORV of foxes and other wild carnivores in Serbia, and since then, the incidence of rabies has been significantly decreased

Methods: In 2010, Veterinary Directorate of Serbia has started multiannual project of oral rabies vaccination of foxes and other wild carnivores (e.g. jackals), supported and co-funded by EU (financed by Instrument for Pre-Accession Assistance). From November 2010 till the end of 2014, nine campaigns of vaccine distributions were completed with the standard program of vaccine delivery twice a year-in autumn and spring. In the first two seasons was used vaccine *Lysvulpen* (Bioveta, Czech Republic), which consists of the attenuated rabies strain SAD Bern, and starting from the seventh campaign, in October 2013, vaccination was conducted with *Fuchsoral* vaccine, containing strain SAD B19 (IDT Biologica, Germany). The measurement of the efficiency of ORV of foxes and other carnivores was based on: a) *post mortem* laboratory examination of brain tissue of target animals (foxes, jackals and other carnivores) by fluorescent antibody test (FAT), b) detection of antibodies against rabies virus in blood serum samples by ELISA and c) detection of tetracycline biomarker in the mandibles for the evaluation of vaccine bait uptake.

Results: The assessment of rabies situation between 2006 and 2014 is presented in Tables 1 and 2. During the passive surveillance, from 2006 to 2014, 3816 brain samples were tested by FAT and 922 (24.16%) reacted positive (Table 1). Within monitoring of ORV effectiveness, rabies was detected in 17 (0.34%) out of 4943 brain sam-

ples analyzed by FAT (Table 2). The number of rabid animals was reduced dramatically, which corresponds to the beginning of ORV of foxes in Serbia. From 2012, the total number of 26 FAT positive brain samples were examined by RT-PCR and all tested cases belonged to RABV field strain.

Table 1. Surveillance of rabies in Serbia between 2006 and 2014

549	192	34.97%
528	160	30.30%
740	233	31.49%
590	181	30.68%
462	104	22.51%
409	43	10.51%
271	9	3.32%
167	0	0.00%
100	0	0.00%
3816	**922**	**24.16%**

Table 2. Monitoring of ORV of foxes in Serbia between 2012 and 2014

1370	10	0.72%
2069	6	0.29%
1504	1	0.07%
4943	**17**	**0.34%**

Analyzed by animal species, the highest prevalence of rabies was recorded in the population of foxes and just sporadically in other wildlife or in domestic animals (Figure 1). Foxes made 84.66% (795/939) of all positive samples. In the population of domestic animals, the disease was more frequently recorded in cats then in dogs (7.13 % vs. 4.26%).

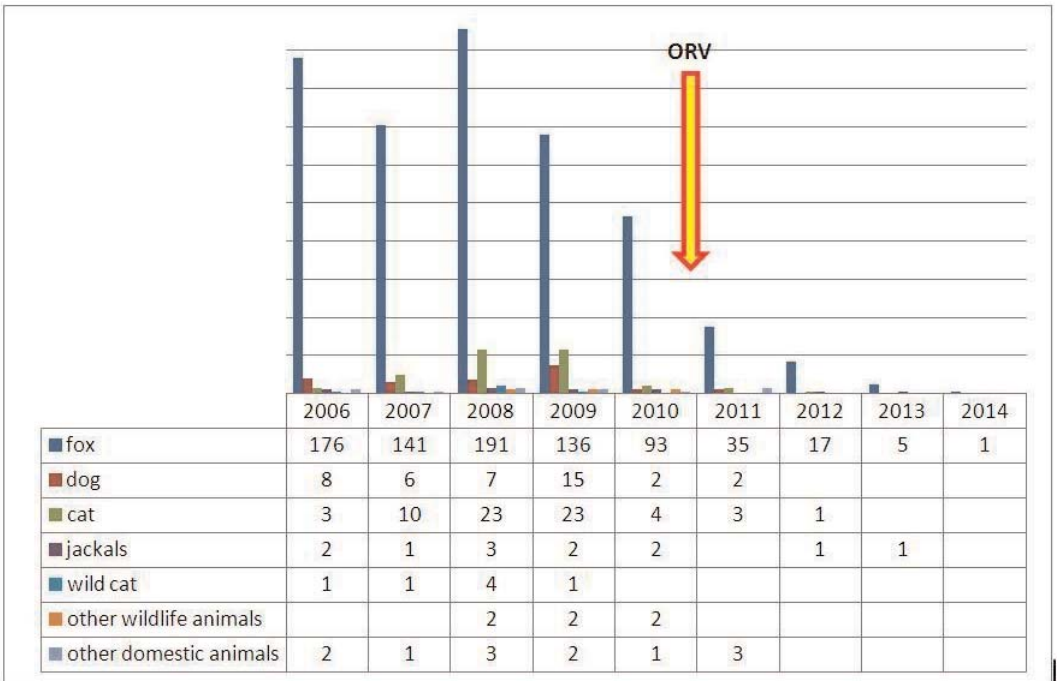

Figure 1: Prevalence of rabies in different animal species between 2006 and 2014

From September 2011 to May 2014, the total number of 4943 brain tissue samples, 4241 blood serum and 4971 mandibles were analyzed. Confirmed rabies-positive brains decreased from 10 in 2011/2012 to 6 in 2012/2013 and eventually to 1 positive case in 2013/2014. The seroconversion rate increased from 10.48% in 2011/2012 to 20.11% in 2012/2013 an 42.23% in 2013/2014. Along with the seroconversion, the number of detected tetracycline positive mandibles demonstrated an increasing tendency in the same period, being: 49.67% in 2011/2012, 62.60% in 2012/2013 and 90.33% in the monitoring programme carried out in 2013/2014.

Conclusion: The presence of rabies in neighbouring countries has enormous influence on the rabies epidemiological situation in Serbia. Lately, the highest number of rabid animals was reported in 2008, with 233 confirmed rabies cases. At the same time, many countries in Balkan region announced elevated number of rabies incidences: 1061 in Croatia, 1089 in Romania, 83 in Bosnia and Herzegovina, 54 in Bulgaria and 43 in Montenegro, and also 3353 cases were reported in Russian Federation and 2164 in Ukraine (WHO Rabies Bulletin Europe, 2008).

Several countries in Balkan region started the programme of oral vaccination: Bulgaria in 2009, Kosovo in 2010, Romania in 2011, Croatia in 2011, Macedonia in 2011, Montenegro in 2011, and Bosnia and Herzegovina in 2011. In Serbia, ORV of foxes and other wild carnivores was launched in 2010. All these countries reported significant reduction of rabies incidence after the implementation of the programme. Oral vaccination of foxes is effective method for elimination of rabies in wildlife population After nine campaigns of ORV in Serbia, the number of rabies-positive animals has declined significantly from 93 in 2010 to only one case in 2014 (Lupulovic et al, 2015).

Implementation of ORV of foxes also had a positive effect on the other animal species. Among the most susceptible wildlife populations are jackals and wild cats. The last case of rabid wild cat was recorded in 2009 and jackal in 2013. Regarding domestic animals, rabies occurred mainly in cats and dogs, as a consequence of sylvatic rabies. The number of rabid dogs and cats is also significantly reduced. In 2009 were registered 15 rabid dogs and 23 cats. The last rabies-positive dog was confirmed in 2011 and rabid cat in 2012.

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Characterisation in France of non-pathogenic lagoviruses closely related to the Australian Rabbit calicivirus RCV-A1: confirmation of the European origin of RCV-A1

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