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## ORAL VACCINATION OF FOXES: PRINCIPLE AND FIELD APPLICATION

### Abstract

Oral vaccination of the red fox against rabies using baits revealed very efficient for eliminating rabies in many European countries. The “Program for control and eradication of rabies via oral vaccination of foxes” elaborated by the Veterinary Office plans to perform aerial vaccine bait distribution in Spring and Autumn until 2015 at least. Campaigns have already been carried out in autumn 2011, spring & autumn 2012 over all the territory of BiH, including Public Awareness Campaigns. The role of Doctors of Veterinary Medicine is of paramount importance for educating the public regarding rabies and re-enforcing the epidemio-surveillance of the disease.

**Key words:** rabies, oral rabies vaccination, monitoring, surveillance, role of the Doctors of Veterinary Medicine.

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## ОРАЛНА ВАКЦИНАЦИЈА ЛИЦИЦА: ПРИНЦИП И ДИСТРИБУЦИЈА НА ТЕРЕНУ

### Кратак садржај

Орална вакцинација црвених лисица против беснила, уз коришћење мамака вакцина, показала се као врло ефикасна у искорењивању беснила у многим државама Европе. Програмом за контролу и искорењивање беснила уз примену оралне вакцинације лисица, који је израдио Уред за ветеринарство БиХ, предвиђена је дистрибуција вакцина из ваздуха у пролеће и јесен, у трајању до 2015. године минимално. Кампања дистрибуције вакцина мамака из авиона у

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БиХ спроведена је три пута до сада, и то у јесен 2011. и у пролеће и јесен 2012. године, укључујући кампање јачања свести јавности. Улога доктора ветеринарске медицине је од изузетног значаја за едукацију и подизање свести јавности о беснилу, али и за успостављање епидемиолошког надзора болести.

**Кључне речи:** беснило, орална вакцинација, мониторинг, надзор, улога доктора ветеринарске медицине.

## INTRODUCTION

As in all over Europe, Rabies has been present in the Western Balkan areas in the dog populations for centuries. It followed a steady decline from 1952 in the former Yugoslavia, while sporadic dog rabies cases still occurred in the 1970s in Central Serbia and Kosovo, accompanied by several human cases (Mutinelli et al., 2004). In the 80,s while dog mediated rabies still persisted sporadically, fox mediated rabies progressed from the north-eastern part of Europe invaded the Balkan area where it is still advancing until reaching Greece recently.

More precisely in BiH until the 70's, dogs accounted for 76% of the cases, with the remainder in domestic cats, cattle, pigs and sheep (Rukavina, Lj., 1973). When selvatic rabies spread from the north into BiH in 1982, dog rabies had considered to have been eliminated (Djuricic, B. et al., 1988). This time, the reservoir and the main victim of the disease was the fox as elsewhere in western Europe with a mean 77% of rabies cases recorded in the fox, with spillovers on cattle (5%), badgers and other mustelids (4%), domestic cats (4%),

roe-deer (3,7%), sheep and goats (2,7%) and the dog accounted for 2% only of the records (Blancou et al., 1991).

The first demonstration of the possibility to eliminate fox rabies from an infected area by distributing in spring and autumn baits containing an attenuated rabies vaccine strain have been given by the Swiss team in 1980 (Steck et al., 1982). Very early they developed all the concepts and methods which were thereafter used by other European countries when they started their own programmes several years later. Now, the methods to follow more or less adapted and improved from to the initial ones are summarized in a report of the Scientific Committee on Animal Health and Animal Welfare. European Commission entitled "The oral vaccination of foxes against rabies" (2002).

## THE "PROGRAM FOR CONTROL AND ERADICATION OF RABIES VIA ORAL VACCINATION OF FOXES" IN BIH

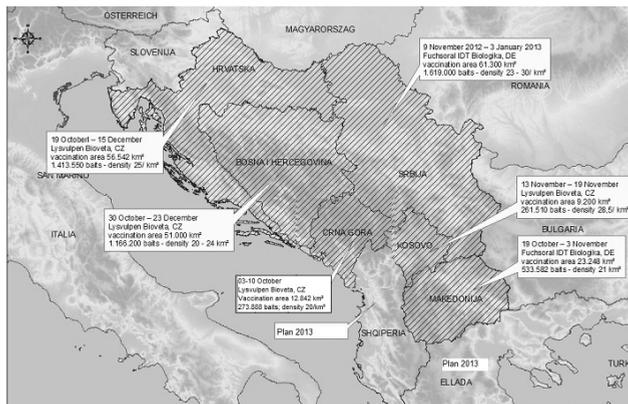
Considering that fox rabies does not respect the administrative borders, and

in order to protect rabies free countries, the European Union decided to fund eradication programmes in most countries in the region. Initiative started in 2009 and during the two following years most countries in the region undertook Rabies control and eradication multi-annual programmes.

In many of the countries in the region the oral vaccination of foxes against rabies started during 2010 & 2011 (see table) and will be pursued twice a year in the coming years.

<b>Oral Rabies Vaccination in the region</b>	
-	Bosnia & Herzegovina – since 2011;
-	Croatia – since 2011;
-	Kosovo* – since 2010;
-	Montenegro – since 2011;
-	FYR Macedonia – since 2011;
-	Serbia – since 2010
-	Albania <sup>5</sup> – plan 2013/2014

Figure 2 describes the Western Balkan countries vaccination where oral vaccination of foxes has been carried out during autumn 2012. This includes the buffer zone of ORV in Slovenia, Hungary, Romania and Bulgaria. Additionally, ORV is also planned to be initiated in Albania and Greece.



**Figure 1.** Western Balkan countries where oral vaccination of foxes has been carried out during autumn 2012. (Source: IPA Multi-beneficiary Project, Western Balkans, Team leader: Dr Richard O'Flaherty)

<sup>5</sup> The European Union provided funds for a five year programme of twice yearly vaccination campaigns covering the entire territory of Albania beginning in autumn 2013 or spring 2014.

The Veterinary Office of BiH developed a “Program for control and eradication of rabies via oral vaccination of foxes”. This document sets out the disease control principles in accordance with the OIE Terrestrial Animal Health Code and WHO recommendations and provides a road map and time frame for medium and long term priority activities.

The rabies control and eradication programme is to be implemented over a short/midterm and a phase and long-term phase:

- The short/midterm phase objective is to reduce the number of rabies cases through progressive control and eradication measures, including oral vaccination of foxes, post-vaccination monitoring and surveillance, as well as preventive measures against re-introduction of disease in disease free areas;
- The long-term objective is to eradicate the disease from Bosnia and Herzegovina and to maintain the disease free status of the country by all control measures, including con-

tinues surveillance and vaccination in case of outbreaks and carrying out post-vaccination monitoring and investigations to better understand the way of transmission, the dynamics and the role of different wildlife animals in BiH, and to prevent the introduction of rabies in disease free areas.

The most visible realization of this programme is the first ORV campaign implemented in autumn 2011.

## RESULTS

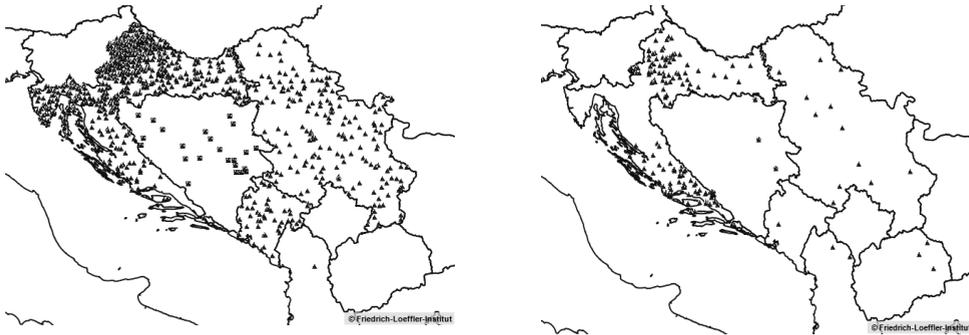
So far three campaigns of aerial distribution of vaccine baits have been carried out in BiH: during autumn 2011, then spring & autumn 2012. The same number of campaigns has been performed in most of the countries in the region.

The surveillance data, notified to the Rabies Bulletin Europe allow comparing the number of rabies cases recorded during the last year before the start of oral rabies vaccination (2009) with those of the year 2012 after an average of three ORV campaigns had been implemented (Table 1).

**Table 1.** Number of rabies cases recorded during 2009, the last year before the start of oral rabies vaccination, and during 2012 after an average of three ORV campaigns had been implemented in the region (Source: Rabies Bulletin Europe).

Country	Domestic animals 2009	Domestic animals 2012	Wild life/foxes 2009	Wild life/foxes 2012	Total 2009	Total 2012
Albania	1	2	0	0	1	2
Bosnia - Herzegovina	10	0	15	3	5	3
Croatia	66	21	718	124	784	145
Kosovo* <sup>6</sup>	0	0	0	0	0	0
Macedonia	0	1	0	2	0	3
Montenegro	7	1	42	0	49	1
Serbia	40	0	141	13	181	13
Total	124	25	916	142	1040	167

We observe a significant decrease in the number of rabies cases: starting from 1040 cases in 2009, this number reached 167 only in 2012. These results are also illustrated by figure 2.



**Figure 2.** Distribution of rabies cases (all animal species) recorded during 2009 (left), the last year before the start of oral rabies vaccination, and during 2012 (right) after an average of three ORV campaigns had been implemented in the region (Source: Rabies Bulletin Europe)

<sup>6</sup> \*This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence.

## **DISCUSSION: THE ROLE OF THE DOCTORS OF VETERINARY MEDICINE FOR CONTROL AND ERADICATION OF RABIES IN BIH**

Whereas very encouraging, these results do not allow to conclude that the fox rabies epidemics had been decreased significantly. In reality, the decrease in the record of positive cases is also the result of a very low and inconstant epidemio-surveillance effort in the region, and particularly in BIH.

For improving this situation, Doctors of Veterinary Medicine must be recalled that they have two very important roles to play. Their first role is to educate the public of the nature and risks posed by rabies for Humans and for domestic animals. Their second role is to actively contribute to the elimination of fox rabies.

- a) Public education and rabies prevention in domestic animals and Humans.

Doctors of Veterinary Medicine are at the front line for protecting farmers and pet owners from the risk if transmission from their cattle, sheep dogs and pets. They inform their clients on the disease, how to recognise its symptoms, what the risk is and how to prevent it. Additionally they encourage the preventive vaccination of the most exposed domestic animals, i.e. ranking them in decreasing risk: cattle, horses, cats then dogs.

Because they are generally the first public health professionals to be informed of any human contamination and they orientate the potentially

contaminated persons to Medical Doctors, their role for preventing human rabies is crucial.

- b) Contribution to the control and the elimination of rabies.

For organising vaccine bait distribution on the infected areas, one must know which areas are infected. Keeping in mind that rabies symptoms are numerous, inconstant and in any case never pathognomonic, always a laboratory diagnostic is absolutely required, thus, the suspect animals must be transported to the laboratory (in Republica Srpska, this laboratory is the "Dr Vaso Butozan" Veterinary Institute in Banja Luka).

When informing their clients on rabies, Doctors of Veterinary Medicine must motivate them to communicate to them (or to the local veterinary administration) by phone and by any other means about the occurrence of any suspect behaviour in wild or domestic animal species. Farmers, hunters, and any person living in the countryside are generally very well informed of what is a normal behaviour of a fox, at which period of the year it is normal or abnormal to see a fox during daytime in the fields or in the middle of the villages.

However precisely because rabies symptoms are inconstant, all reasons for submitting animals to the rabies laboratory are good reasons: any animal found dead must be submitted to the laboratory wherever it may be found in the woods as well as along a road. Suspect animals are not only the aggressive ones: aggressivity

is only observed in less than 50% of rabid foxes.<sup>7</sup> As a result any wild or domestic animal who died for no obvious reason (animals claimed to have been “poisoned”), or who died after a loss of appetite must be sent to the laboratory. In the above mentioned study, anorexia was the most frequent symptom (50 out of 53 foxes).

One must remember that a negative result is a result: the only means for insuring that an area is rabies free (an important point again for organising oral vaccination campaigns) is to have a high density of laboratory examination from the area.

## CONCLUSION

Oral vaccination of wild animals against rabies has proved to be the most effective method to eliminate fox rabies. EU support and strong collaboration in the region are crucial for eliminating this dangerous zoonosis, They already brought unambiguously positive results, in spite of the difficulty met for:

- the re-enforcement of laboratory diagnostic facilities and capabilities;
- the organization of campaigns which require considerable know-how, practical experience, enthusiasm of all stakeholders (veterinarians, hunters, governmental officials); and

- the political will and financial resources.

However, we are still only half way. The main weakness of the oral vaccination programmes against fox rabies in the region remains the difficulty in organising a correct epidemio-surveillance of the disease.

Because the Doctors of Veterinary Medicine are the best informed public health actors on the terrain, their involvement for increasing the public awareness and motivation for sending to the laboratory all suspect animals will be determinant for the surveillance of the disease and its final eradication.

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<sup>7</sup> 53 foxes used as control animals (during experiments for vaccine research in the Nancy laboratory) had been observed daily following experimental inoculation with rabies virus (from naturally infected foxes). Only 26 (49%) exhibited spells of aggressivity and/or furor (George J.P. et al., 1980).

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