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Implementation and monitoring of oral rabies vaccination of foxes in Kosovo between 2010 and 2013—An international and intersectorial effort

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ABSTRACT

The European Union has used instrument for pre-accession (IPA) funds to provide technical assistance and supplies for the eradication, monitoring and control of rabies in several pre-accession countries. As a result, since 2010, multi-annual oral rabies vaccination (ORV) programmes for eliminating fox rabies have been launched in six Western Balkan countries.

Here the implementation of the ORV programme in Kosovo, the smallest of the West Balkan countries, is described. Associated challenges under difficult political conditions, potential biases, and the results of rabies surveillance and monitoring of ORV campaigns (bait uptake and immunisation rates) since 2010 are reported.

Introduction

In a geopolitically important position representing the South-eastern Gateway to Europe, the Balkans, and in particular the Western Balkans, has been a cultural and politically unstable region for centuries. The term Western Balkans is more a political than a geographical designation for a region of Southeast Europe that is not yet part of the European Union (EU). However, with Croatia being a member state (MS) since July 2013 and Serbia, Bosnia and Herzegovina, Montenegro, Kosovo, Macedonia and Albania aiming at joining the EU in the future this term may no longer be applicable.

Rabies, a zoonotic disease with a uniquely high fatality rate (Jackson, 2013; Fooks et al., 2014), has been endemic in the Western Balkans for centuries (Mutinelli et al., 2004). About the same time as strict sanitary measures and mass parenteral vaccination resulted in elimination of the age-long plague of dog-mediated rabies in the early 1990s (Mutinelli et al., 2004), fox-mediated rabies became a new challenge (Müller et al., 2012a). Following the emergence of fox rabies, assumed to originate in Kaliningrad at the beginning of the 1940s, the disease spread rapidly over the continent. As a result large parts of Central and Western Europe were already affected by the mid-1970s. Surveillance data suggest that

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fox rabies invaded the Western Balkans from neighbouring regions in Hungary, Romania and Slovenia (www.who-rabies-bulletin.org; (Mutinelli et al., 2004). For reasons that are not fully understood, the sylvatic rabies epidemic in the Western Balkans only advanced southwards slowly. Although certainly confounded by a lack of adequate surveillance and laboratory diagnosis at the time, fox rabies did not emerge in Serbia, Kosovo and Macedonia until 1986, 1998 and 2011, respectively (Kirandjiski et al., 2012; Mutinelli et al., 2004). With the emergence of the disease in Northern Greece in 2012 the fox rabies epidemic reached its southeastern-most extension (Tsiodras et al., 2013).

Due to the strict implementation of oral fox rabies vaccination (ORV) programmes, large parts of Western and Central Europe have been officially declared free from fox-mediated rabies. Consequently the boundaries of the disease-free area have been pushed towards the eastern and southern borders of the EU (Cliquet and Aubert, 2004; Freuling et al., 2013; Müller et al., 2012a). As complete elimination of terrestrial rabies from the EU appears to be feasible in the short or medium term, the EU is giving top priority to rabies control (Freuling et al., 2013). Attention has now shifted towards the elimination of the disease in countries neighbouring the EU (Demetriou and Moynagh, 2011; Müller et al., 2012a). The EU animal disease eradication fund is being used to support ORV programmes in Kaliningrad and parts of Belarus and Ukraine. Similarly, funds dedicated to support the accession process are being deployed to support ORV in the Western Balkans (Müller et al., 2012a). These funds are channelled through the instrument for pre-accession (IPA), which is being used to procure supplies of rabies vaccine and to provide relevant technical assistance to support eradication programme activities (Demetriou and Moynagh, 2011). Since 2010, multi-annual ORV programmes have been launched in six Western Balkan countries, whilst plans are in place for a nationwide ORV programme in Albania commencing in 2014 (Demetriou and Moynagh, 2011; Müller et al., 2012a). Kosovo is the smallest of the West Balkan countries. The last confirmed case of autochthonous human rabies on the territory of Kosovo occurred in 1954. In October 2007, two cases of rabies in foxes were reported in the region near the border with the Former Yugoslav Republic of Macedonia (FYROM). Although no further rabies cases have been reported since, being sure of absence of disease in Kosovo is difficult because (i) rabies is endemic in neighbouring countries of FYROM, Serbia, Montenegro and Northern Albania (who-rabies-bulletin.org), (ii) borders are porous to wildlife, and (iii) of insufficient surveillance to rule out endemic infection in Kosovo.

The IPA programme supported control programmes for rabies and classical swine fever (CSF) through projects managed by the European Union Office in Kosovo. This report covers activities undertaken within the framework of one such project (EuropeAid/127852/D/SER/KOS), which provided technical assistance to the Food and Veterinary Agency of Kosovo (FVA) and Kosovo Food and Veterinary Laboratory (KVL). Here we describe the implementation of the ORV programme and associated challenges, discuss potential biases, and report the results of rabies surveillance and monitoring of ORV campaigns (bait uptake and immunisation rates) in the Republic of Kosovo since 2010.

Materials and methods

Study area

Kosovo has an area of 10,908 km^2. It lies between latitudes 41° and 44° N, and longitudes 20° and 22° E and is bordering Serbia to the North and East, Montenegro to the Northwest, Albania to the Southwest and FYROM to the South. Kosovo is surrounded by several mountain ranges with peaks as high as 2656 m. Within the territory, Kosovo is subdivided into two large plain areas, one to the north-east and one to the south-west, covering approximately 36% of the territory and lying at elevations between 400 and 700 m above sea level. These plain areas are divided by central highland ranges rising to elevations of about 1000 m. The population density in the country was last reported at 1.8 million in 2011 (Anon., 2011).

Implementation of rabies surveillance and oral rabies vaccination

In Kosovo, the FVA of the Ministry of Agriculture, Forestry and Rural Development of Kosovo is in charge of rabies control and the implementation of the rabies eradication programme using ORV. Initially, diagnostic capacities at the KVL in Pristina had to be established. Prior to testing field samples KVL staff received intensive in-service training by the Kimron Veterinary Institute, Israel (KVI-IL), on performing rabies diagnostic tests using reference material provided and the drafting and implementation of standard operating procedures (SOPs) for handling samples. Technical assistance and support concerning implementation of rabies surveillance and operational activities for ORV campaigns was further provided by the Animal Health and Veterinary Laboratory Agency, UK, the Friedrich-Loeffler-Institute, Germany, EuropeAid, and the Veterinary Epidemiology and Economics Research Unit (VEERU) & PAN Livestock Services Ltd. of the University of Reading, UK.

Oral rabies vaccine

A SAD-derived oral vaccine (SAD Berne strain) with a national registration in another EU Member State was used in all ORV campaigns conducted in Kosovo since 2010. The bait casing contained 150 mg tetracycline (TC) to assess bait uptake in the target species. Before each ORV campaign, vaccine baits were shipped from the manufacturer to Kosovo in refrigerated vehicles and stored at −20 °C by a local contractor until distribution in the field. The maintenance of the cold chain was confirmed using temperature data loggers that were shipped and stored together with the baits. The titre of each batch of vaccine virus was checked on arrival to ensure it was above the minimum recommended effective dose (Anon., 2005). Vaccine titres were independently determined at the WHO Collaborating Centre for Rabies Surveillance and Research at the Friedrich-Loeffler-Institute (FLI), Germany, in three independent runs using 5 out of 25 baits. The mean vaccine titres of the different batches used as determined both by the manufacturer and FLI are shown in Table 1.

Oral vaccination campaigns

Between 2010 and 2013, with the exception of 2012, ORV campaigns were conducted twice a year, in spring and autumn when environmental conditions were optimal. With an area of 9200 km^2 almost the entire territory of Kosovo was covered. In 2012, due to a delay in budgetary approval the spring ORV campaign had to be abandoned, hence vaccine baits were distributed only in an autumn campaign.

Vaccine baits were mainly distributed using fixed-wing aircrafts (Cessna 172) equipped with the SURVIS-system for automatic dropping and registration of individual bait positions (for details see Müller et al., 2012c). In general, an average flight altitude of 300–500 m above ground and an average speed of 170–180 km/h were applied. Initially, during the first four ORV campaigns a flight-line distance of 1000 m and a bait density of 23 baits/km^2 were used. A modification of the dispersal scheme was applied during the campaigns as follows: in a 5 km wide vaccination belt bordering neighbouring countries (2000 km^2) the flight-line distance was reduced to 500 m. The flight-line distance in the other parts