

## EPIZOOTIC SITUATION AND RISK OF RABIES EXPOSURE IN POLISH POPULATION IN 2000, WITH SPECIAL ATTENTION TO LUBLIN PROVINCE

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**Abstract:** In Poland in 2000 a total of 2,221 cases of animal rabies were reported, including 1,874 (84.4%) of wild animals. The evaluation of epizootic situation in 2000 has shown a few cases of animal rabies in western provinces of Poland, so in regions where a programme aimed at oral vaccination of foxes was introduced. Most cases of animal rabies were identified in the northeastern region, as well as in eastern and central Poland. In October 2000 in Warmińsko-Mazurskie province (northeastern region of Poland) rabies was responsible for the death of 59-year-old woman, bitten by a rabid cat, and refused post-exposure specific antirabies prophylaxis. Among domestic animals, the highest incidence of rabies occurred in cattle - 167 cases (7.5%), cats - 113 (5.1%) and dogs - 61 (2.7%). In the group of wild animals, red foxes accounted for 1,587 (71.5%) cases, raccoon dogs for 210 (9.5%) and martens for 36 (1.6%). People have been vaccinated against rabies in all provinces of Poland. The number of people vaccinated against rabies in regions adjoining the western border was much smaller compared to other provinces of Poland. The highest rates of using post-exposure prophylaxis occurred in northeastern regions of Poland (Warmińsko-Mazurskie province) and eastern and central parts of Poland. On the basis of analysis of cases consulted in the dispensary of rabies prophylaxis in the Department of Infectious Diseases in Lublin, it can be concluded that the number of people with exposure to rabid animals is rather small. Most vaccinations are carried out when animals suspected of being rabid bite patients. These are primarily domestic animals - dogs and cats.

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### INTRODUCTION

Rabies is a zoonotic disease of humans caused by the RNA virus belonging to the Lyssavirus genus of the Rhabdoviridae family. Using molecular biology techniques seven genotypes were isolated: a standard virus - Rabies Virus (RV), Lagos, Mokola, Duvenhage, EBL1, EBL2 (European Bat Lyssavirus), ABL (Australian Bat Lyssavirus) [2, 13].

Rabies is known to be endemic in many regions, mainly in warm climate zones of Asia (especially in India), Africa and South America, and human rabies is responsible yearly for more than 35,000 deaths worldwide

[1, 2, 4, 5, 6, 13]. Greenland, Antarctica, Pacific islands, Japan, New Zealand and some geographically isolated areas such as Sweden are thought to be rabies-free. Great Britain, Denmark and Australia are no longer declared rabies-free because some cases of rabies infection in bats have been diagnosed since 1996 [13]. In Australia in 1996 and in 1998 human rabies cases that ended in deaths were reported. Both cases were the consequence of Australian Bat Lyssavirus (ABL) infection and the latter occurred after bite by the flying fox (fruit bat) [2, 3].

The new epidemiological problem that has appeared in Europe recently, is rabies in European bats (insect bats). Most cases were reported in Denmark, the Netherlands

**Table 1.** Number and percentage of domestic and wild animals with confirmed rabies in Poland in subsequent quarters of 2000.

Quarter of the year 2000	Domestic animals		Wild animals		Total Number
	Number	%	Number	%	
I	38	8.2	426	91.8	464
II	49	11.9	362	88.1	411
III	91	21.2	339	78.8	430
IV	169	18.4	747	81.6	916
Total	347	15.6	1,874	84.4	2,221

**Table 2.** Confirmed cases of rabies in different animal species in I, II, III and IV quarters of 2000.

Animal species	Quarter of the year 2000				Total	%
	I	II	III	IV		
Dog <i>Canis familiaris</i>	11	11	15	24	61	2.7
Cat <i>Felis domestica</i>	18	20	23	52	113	5.1
Cattle <i>Bos taurus</i>	9	18	53	87	167	7.5
Goat <i>Capra hircus</i>	-	-	-	1	1	<0.1
Sheep <i>Ovis aries</i>	-	-	-	1	1	<0.1
Horse <i>Equus caballus</i>	-	-	-	4	4	0.2
Red fox <i>Vulpes vulpes</i>	370	301	277	639	1,587	71.5
Raccoon dog <i>Nyctereutes procyonoides</i>	42	41	42	85	210	9.5
Marten <i>Martes martes</i>	6	6	12	12	36	1.6
Polecat <i>Mustela vison</i>	2	2	1	3	8	0.4
Wolf <i>Canis lupus</i>	1	1	-	-	2	<0.1
Deer <i>Cervus elaphus</i>	1	-	-	1	2	<0.1
Elk <i>Alces alces</i>	-	-	-	1	1	<0.1
Roe-deer <i>Capreolus capreolus</i>	3	2	1	-	6	0.3
Badger <i>Meles meles</i>	1	5	4	3	13	0.6
Bat <i>Plecotus auritus</i>	-	2	2	2	6	0.3
Ferret <i>Mustela putorius furo</i>	-	2	-	1	3	0.1
Total	464	411	430	916	2,221	100.0

and Germany. The EBL1 virus strain was isolated in Denmark in 1998 from three sheep with rabies, which is surprising, because it has never before been isolated from domestic animals.

Despite preventive campaigns performed on a wide scale, the considerable numbers of cases of both wild and domestic animal rabies are still registered in Europe, as well as occasional cases of human rabies that inevitably lead to death [2, 4, 6].

According to the World Health Organization reports, 3 human rabies cases occurred in Russia at the beginning of 2000. In October 2000 in Poland (in Warmińsko-Mazurskie province – northeastern region of Poland) rabies was responsible for death of a 59-year-old woman who was bitten by a rabid cat and refused post-exposure specific antirabies prophylaxis. This was the first case of human rabies in Poland for 14 years (Report 10/A/00 of Main Sanitary Inspectorate).

The aim of this study was to assess the epizootic situation and risk of rabies exposure in Polish population in 2000, with special attention to Lublin province, and to evaluate indications for using antirabies vaccine in patients reporting to the dispensary for rabies prophylaxis in the Department of Infectious Diseases, Medical Academy of Lublin.

## MATERIALS AND METHODS

The analysis of rabies epizootic in Poland in 2000, i.e. the distribution of rabies sources and species of infected animals was conducted according to Main Veterinary Inspectorate reports concerning animal infectious diseases.

The number of persons vaccinated after exposure to rabid or rabid suspected animals was taken from the Yearly Report on Incidence of Infectious Diseases and Intoxications with Chemicals in 2000, issued by the Main Sanitary Inspectorate.

Epizootic situation in Lublin province was evaluated according to data from the Regional Veterinary Inspectorate in Lublin. The analysis of indications for using antirabies vaccine in patients reporting to the dispensary of rabies prophylaxis in the Department of Infectious Diseases at the Medical Academy in Lublin was based upon individual questionnaires of vaccinated patients.

## RESULTS

The distribution of rabies sources in Poland in 2000 is shown in Figure 1. It is easily seen that the territory of Poland can be divided into three zones: low, moderate and high incidence of animal rabies. Occasional cases of animal rabies were reported in four western provinces of Poland: Lubuskie, Zachodniopomorskie, Opolskie and Dolnośląskie. The highest incidence was observed in northeastern, eastern and central parts of Poland.

Table 1 and Figure 2 show that in 2000 in Poland a total of 2,221 cases of animal rabies were reported, including 1,874 (84.4%) in wild animals. The incidence



**Table 5.** Numbers of persons vaccinated in the dispensary of rabies prophylaxis in the Department of Infectious Diseases of Medical Academy in Lublin after exposure to rabid or rabies-suspected animals.

Animal species (Source of exposure)	Number of vaccinated persons		Total
	A	B	
Dog <i>Canis familiaris</i>	5	36	41
Cat <i>Felis domestica</i>	-	14	14
Red fox <i>Vulpes vulpes</i>	6	3	9
Squirrel <i>Sciurus vulgaris</i>	-	2	2
Bat <i>Plecotus auritus</i>	-	1	1
Total	11	56	67

A – animals with confirmed rabies, B – rabies-suspected animals.

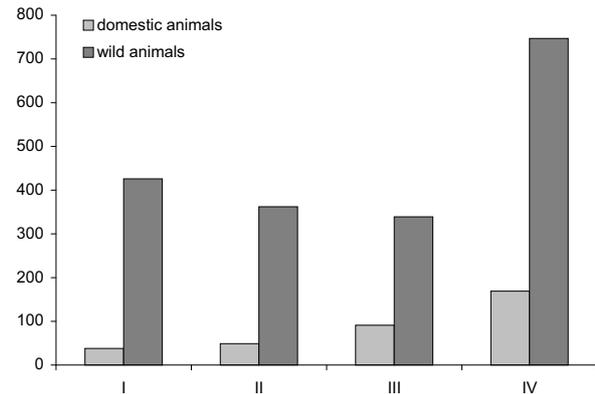
Academy in Lublin, which also serves as the consulting clinic for the entire province. Patients reporting there are mostly inhabitants of the city of Lublin and nearby towns and villages.

Table 5 shows the number of persons vaccinated in the year 2000 in this facility after exposure either to animals with confirmed rabies or rabies-suspected animals, belonging to various species. Among 67 vaccinated patients 11 had exposure to animals with confirmed rabies: 5 to dogs and 6 to foxes. The remaining 56 persons had exposure to animals in which rabies could not be confirmed or excluded: 36 to dogs, 14 to cats, 3 to foxes, 2 to squirrels and 1 to a bat. All the mentioned patients received vaccines produced by the Institute Pasteur-Merieux-Connaught, prepared on Vero cells (Imovax-Rabies Vero). Five doses of rabies vaccine were administered intramuscularly in the deltoid muscle on days 0, 3, 7, 14 and 28. Antirabies serum was given in addition, on day 0 at a site distant from the vaccine site, to 9 individuals, who had particularly aggressive exposure to rabies animals. Specific antirabies serum is produced by the Institute Pasteur-Merieux-Connaught and the normal dose is 40 IU/kg.

## DISCUSSION

In the period following World War II, rabies virus circulated in Poland in domestic animals, primarily in dogs. Since the 1960's, there was a shift in the incidence of animal rabies to a group of wild animals with red foxes as a main reservoir. Other species of wild and domestic animals are the lateral branches of the rabies epizootic of foxes [9].

The overall results of the evaluation of animal rabies cases in Poland in 2000 seem to indicate that foxes and raccoon dogs pose the main source of infections among wild animals, and cattle and cats among domestic animals.



**Figure 2.** Numbers of domestic and wild animals with confirmed rabies in Poland in subsequent quarters of 2000.

Laboratory examination of viral strains from different regions of Poland conducted in the State Institute of Veterinary in Puławy (Lubelskie province) using Restriction Fragment Length Polymorphism (RFLP) has shown the presence of 4 biotypes (variants) of Rabies virus (RV): raccoon biotype (RD), fox variant (FV), wolf-fox biotype (WF), and fox biotype (F) [13].

European Union regulations for combating rabies have enforced the use of oral vaccination of foxes in Poland. Since 1993, twice a year (in spring and autumn), the oral, live attenuated vaccine (Fuchsoral - containing strain SAD-B19, made in Germany) has been used in the 100 km wide zone along the western border. In 1997, on the territory of former Przemyskie district (now a part of Podkarpackie province), the French vaccine Raboral was used. Live, recombinant vaccine Raboral contains the strain of Vaccinia virus with an incorporated gene for glycoprotein G [6, 9].

The evaluation of the epizootic situation in 2000 revealed a relatively small number of cases of animal rabies in western provinces of Poland, where the oral vaccination of foxes was introduced. This is obviously the reason why the number of people vaccinated against rabies in regions adjoining the western border was distinctly smaller compared to the eastern provinces of Poland. The only exception was Zachodniopomorskie province. Although no cases of animal rabies were reported, quite a large number of people living in this province received post-exposure prophylaxis, because it could not be excluded that some of the suspected animals were not infected. The prophylactic vaccination was a preventive measure. Most cases of animal rabies were identified in the northeastern region (Warmińsko-Mazurskie province), as well as in eastern and central Poland.

Epizootic situation of rabies has changed the programme of oral vaccination for foxes. According to the Ministry of Agriculture regulations (Dz. U. Nr 53, 337) oral vaccines are distributed in amount of 16 doses

per square kilometer, in some regions twice a year (spring and autumn), and in a few provinces once a year (during autumn). The latter programme has been introduced in 8 provinces (Kujawsko-Pomorskie, Łódzkie, Małopolskie, Opolskie, Pomorskie, Śląskie, Świętokrzyskie, Warmińsko-Mazurskie) with exception of Podlaskie. In Lubelskie, this programme has been introduced only in Puławy district.

There are two methods for monitoring animal vaccination efficacy. One is to measure the level of tetracycline in bones (tetracycline is used as an ingredient of oral rabies vaccine and is deposited in bones). The alternative method is to measure of the level of antibodies against rabies virus. The rate of vaccine catching reaches 78 percent [13]. In provinces where the vaccination programme for foxes was introduced the number of rabies cases has distinctly decreased [6, 13]

On the basis of analysis of cases consulted in the dispensary for rabies prophylaxis in the Department of Infectious Diseases in Lublin, it can be concluded that the number of people with exposure to rabid animals is rather small. It should be mentioned that not every infected animal is a source of rabies and presents a danger for humans. On the other hand, even one rabid animal can be the reason for prophylactic vaccination of many patients. Most vaccinations are performed when animals suspected of being rabid bite patients. These are predominantly domestic animals - dogs and cats - that have run away or died and there was no opportunity to test them on rabies. The results of epidemiological analysis and evaluation of post-exposure vaccinations in patients in the years 1986-1998 were similar [11, 12].

Since 1996 there has been a progressive increase in the number of animals that are rabies positive in the Lublin province [7]. The current epizootic situation of rabies in eastern part of Poland indicates that most animals suspected of being rabid are actually infected with the rabies virus [12].

Rabies virus is difficult to eradicate because it is present mainly in wild animals, including lesser known groups of different species. The changes in biocenosis caused by irresponsible human activity, such as decreasing the number of birds of prey and using pesticides, can lead to an increase in the number of rodents that are food for foxes and can sustain the circulation of the rabies virus in nature [8, 10].

So far, rabies remains in Poland an epidemiological and economic problem. Controlling rabies needs a close cooperation of medical and veterinary services, as well as careful information of the human society on the sources and pathways of rabies.

## CONCLUSIONS

1. The main source of rabies virus in Poland is the red fox. The other important sources are raccoon dogs among wild animals, and cows and cats among domestic animals.
2. Rabies epizootic in 2000 occurred mainly in the northeastern, eastern and central parts of Poland, where extensive programmes of oral vaccination of foxes have not been introduced.
3. Rabies remains endemic on the territory of Lublin province (Lubelskie).
4. The drastic decrease of cases of animal rabies in western Poland clearly indicates that oral vaccination of red foxes in central Europe, and perhaps other animal species posing main sources of rabies virus in other parts of world, could be a highly efficient measure for the prevention of rabies.

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