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EPIDEMIOLOGICAL AND EPIZOOTIOLOGICAL EVALUATION OF RABIES IN WARMIAN-MAZURIAN PROVINCE IN THE YEARS OF 1999-2000

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ABSTRACT

The aim of this elaboration has been to present the range of rabies threat in Warmian-Mazurian province in the years of 1999-2000 with regard to humans and animals. In comparison to the whole country, the highest number of infected animals was observed in the discussed area during both of these years. In Warmian-Mazurian province 3.19 of infected animals for each 100 km² were counted in the years of 1999-2000 while the country mean was 1.07. The majority of the sick wild animals were foxes and raccoons, while among farm and domestic animals the highest places were taken by cattle and cats. One human died of rabies in the year 2000 in this province. This has been the only case in Poland for 15 years. In the years of 1999-2000, 577 individuals suspecting the possibility of being infected with the rabies virus reported to Epizootic Diseases' Clinic in Olsztyn. 348 of them were qualified for vaccination. Vaccination of wild animals bears considerable importance in the limitation of rabies spreading. Oral immunization of foxes in Poland began in 1993, while the first vaccines in Warmian-Mazurian province were scattered in 1999. The mass vaccination of foxes, compulsory vaccination of cats and limitation of the number of loitering animals could decrease the rabies virus spreading in the discussed area.

Key words: rabies, occurrence, diagnostics, vaccination of foxes.

INTRODUCTION

Rabies is an enormous epidemiological and epizootiological problem [7]. It is a disease of global reach. The following countries and regions are free of rabies: Scandinavia, Spain, Portugal, Greece, Japan, New Zealand, Guyana, Albania, Cyprus, Island, Uruguay and Libya. Until recently this group included also Australia and Great Britain, however the situation changed in 1996, when in both countries bats were diagnosed with rabies, and in Australia also a human [22].

Every year about 4 000 000 individuals in the whole world is subject to vaccination following the exposure. Each year over 20 000 cases are diagnosed in animals in Europe, however – like in North America – the disease in humans is very rare in this part of the world. On the other hand, because of the lack of proper prophylaxis, about 30 000 deaths of humans yearly are noted in the developing countries [15].

Intravital laboratory methods applied in the rabies diagnostics in humans consist in the examination of: skin segment from the nape of the neck area or cornea print preparation with IF reaction for the presence of virus antigens, analysis of saliva in order to isolate the virus, analysis of blood plasma and cerebrospinal fluid for the presence of antibodies, search for viral RNA in saliva by means of PCR method. Tests finished with a negative result do not exclude the infection [2].

Each person suspected of contact with a rabid animal is subject to protective vaccination. The proper prophylaxis consists in active or passive-active immunization – in case of biting by a wild animal and in case of numerous or deep bites by domestic animals, especially in the well-innervated areas, such as face, hands, neck, genitals as well as in case of salivation of mucous membranes [15]. Human immunity plasma is applied at present (spreading half of the dose around the wound is recommended) and safe vaccine produced on Vero cells, intramuscularly, in 0, 3rd, 7th, 14th and 28th day after exposure. Until 1996 a booster dose in the 90th day after the contact with an animal suspected with rabies was applied [17, 2].

The rabies diagnostics of animals in Poland is conducted in a way determined by the Ministry of Agriculture according to OIE standards [3]. The following laboratory methods are used: staining of Babes-Negri bodies in histological smears of brain, direct immunofluorescence test (IF), which detects the antigen presence in brain tissue, and biological assay on mice sucklings (MIT), conducted in case of bites in humans and animals with a negative result of IF test [15, 9].

The immunofluorescence reaction is characterized with 98-100% sensitivity and specificity [2], and it is a relatively fast, accurate and cheap method [20].

The disease is known as forest rabies (occurring in wild animals) and city or street rabies (homeless dogs and cats) [2]. Rabies in dogs was eliminated in Europe in the first half of the XX-th century through prophylactic vaccination as well as through the limitation of homeless animals [22], yet the most important role in the chain of the disease transmission in the world is played by dog [2]. This species is the main reservoir and vector of rabies virus in Asia, Africa, South and Central America.

In Asia also foxes, wolves and jackals constitute a serious threat, in Africa it is mongoose, jackal, hyena, kudu antelope, in South and Central America - vampire bats, in Australia - fruit-eating and insect-eating bats, while in North America it is fox, racoon, skunk and coyote [5, 2, 22].

In Europe since the mid-50s, actions related to counteracting street rabies resulted in the fact that red fox (*Vulpes vulpes*) became the main host of the rabies virus. Apart from that, the number of cases among raccoons is increasing in the Baltic countries including Poland [6, 22].

Until 1949 Poland was the area of large epizootic of rabies among domestic animals [23]. The situation changed radically when yearly, universal dog vaccination started in 1948. In the mid-60s, the number of rabies cases among wild animals began to outnumber the number of infections among domestic animals, which has become a rule [11]. In the years of 1976-2000, cases of rabies in foxes constituted 66.92%, raccoons 5.94%, cats 7.12%, and dogs 4.42% [14].

As Mól [14] says, Żmudziński and Smreczak determined four main biotypes of the virus: raccoon biotype (RD) – in the northern part of the country, fox variant biotype (FV) – in the eastern part, fox-wolf biotype (WF) – in south-eastern Poland in the strictly determined area, and fox biotype (F) – dominating westwards of the Vistula.

Vaccination of wild animals plays considerable importance in the limitation of rabies spreading. Oral immunization of foxes in Western Europe started at the end of the 70s. In 1989 the European Union made a decision to support the actions in the EU member countries and in the 50-100 km-strip along its borders in the neighboring countries. Until 1991 the vaccine had been placed practically in all Western Europe [8]. As a result of that vaccination, the highest number of rabies cases among the countries of our continent, where they are registered, have been observed in Poland since 1992 [11]. Data concerning the virus occurrence in the area of the former Soviet Union are poor, but indicate frequent occurrence and widespreading of rabies in this area [2].

Oral vaccination of foxes in our country commenced in late spring of 1993 in a 100km-strip along the western border in 6 provinces: Szczecin, Gorzów, Legnica, Jelenia Góra, Wałbrzych and Zielona Góra. Vaccination included next regions in the following years [5, 7]:

- in 1994 provinces of: Koszalin, Słupsk, Piła, Katowice, Bielsko-Biała, Skierniewice, Warsaw,
- in 1995 - Gdańsk, Bydgoszcz, Konin, Leszno, Poznań, Wrocław, Opole, Częstochowa,
- in 1996 - Krosno, Nowy Sącz, Elbląg, Piotrków,
- in 1997 - Kraków,
- in 1998 – Tarnów and Sieradz.

The efficiency of these vaccinations is undoubtedly high, which can be most clearly seen in the provinces where the vaccination program has been conducted for 3-4 years [12]. In 1993 the majority of the disease foci were found in the west and south of Poland. The vaccination action radically changed that picture, moving the epizootic infection foci into the area of central Poland in 1996 [24], while in 1998 eastwards of the Vistula – into the areas then not included into the planned vaccination action [2]. In 1998 the majority of rabies cases among animals were registered in the areas of Suwałki and Olsztyn provinces [7, 18]. Also during that period the highest number of humans threatened with contact with infected or suspected animals was vaccinated against rabies in Olsztyn province. In the present epizootic situation, wild animals suspected with infection, especially in the eastern regions, are regarded as rabid [18]. Until 1998 no prophylactic vaccination of wild animals in the former Olsztyn province were conducted [7, 18]. In the years of 1999-2000 the smallest, after Lublin province, number of vaccine doses were distributed in Warmian-Mazurian province in comparison to other areas of the country [14].

As can be seen in the Report on forests status in Poland [16], the mean forestation of our country amounts to 28.35%. Warmian-Mazurian province is slightly above that mean, since woods here constitute 29.1% of the overall surface. It is connected with the occurrence of a high number of wild animals, including foxes and raccoons being a natural reservoir of the rabies virus.

The goal of this elaboration has been to present the range of rabies threat in Warmian-Mazurian province in the years of 1999-2000 with regard to humans and animals.

MATERIAL AND METHODS

The data concerning the occurrence of rabies in humans and animals in the area of Warmian-Mazurian province in the years of 1999-2000 are included in the examination documentation of the Veterinary Hygiene Department in Olsztyn and of Epizootic Diseases' Clinic of the Provincial Specialist Hospital in Olsztyn.

Laboratory tests for rabies with immunofluorescence method, using French manufacture conjugate – Diagnostic Pasteur – were conducted on 1529 samples in the Veterinary Hygiene Department in the years of 1999-2000. In 1999, 641 samples originating from animals suspected of rabies were reported for analysis. In the year 2000 there were 888 of them.

In 1999, 243 individuals reported to Epizootic Diseases' Clinic of the Provincial Specialist Hospital in Olsztyn suspecting themselves of infection with the rabies virus. In the year 2000, there were 334 of such individuals. Totally 577 individuals were included in the examination within both of these years. The type of contact with animals suspected of rabies or rabid, during which the risk of virus penetration into the organism through the damaged skin cover or mucous membranes occurred, constituted the basis for the qualification of patients for vaccination.

RESULTS AND DISCUSSION

In 1999 - 314 (48.98%) animals were found rabid, while in the year 2000 - 439 (49.44%). In both years 753 samples, i.e. 49.25% (table 1), gave a positive result. Generally, in the years of 1999-2000, there were 3372 cases of rabies reported in animals in Poland [14]. The highest numbers of rabid animals were found in Warmian-Mazurian province in 1999 as well as in 2000. In Warmian-Mazurian province 3.19 of infected animals for each 100 km² were counted in the years of 1999-2000, while the country mean amounted to 1.07 [14].

Table 1. Species of rabid animals in Warmian-Mazurian province in the years of 1999-2000

Year Assay	Farm and domestic animals (heads)					Total (heads)	Wild animals (heads)							Total (heads)	Total	
	Cattle	Horses	Goats	Dogs	Cats		Foxes	Raccoons	Martens	Badgers	Ferrets	Deer	Bats		heads	%
1999 641	53	-	1	5	11	70	139	87	9	4	2	2	1?	244	314	48.98
2000 888	70	3	1	18	35	127	186	106	13	3	3	1	-	312	439	49.44
Total	123	3	2	23	46	197	325	193	22	7	5	3	1?	556	753	49.25

?) – the result in case of one bat was doubtful due to late-supplied sample

In 1999 in Warmian-Mazurian province, 244 wild animals were diagnosed with rabies, including: 139 foxes, 87 raccoons, 9 martens, 4 badgers, 2 ferrets, 2 deer and 1 bat. Among farm and domestic animals, the disease was found in 53 heads of cattle, 11 cats, 5 dogs and 1 goat, which gives a total of 70 animals. In the year 2000 the percentage of rabid animals was even higher. Rabies was found 312 wild animals: 186 foxes, 106 raccoons, 13 martens, 3 badgers, 3 ferrets, 1 deer and in 127 domestic animals: 70 heads of cattle, 35 cats, 18 dogs, 3 horses and 1 goat.

During the last decade in Poland, the highest places among rabid farm and domestic animals were taken by cattle and cats. In case of cattle this is related to the penetration ease of infected foxes into its grazing areas, while in case of cats their active lifestyle threatens them with numerous contacts with foxes in their common habitat and feeding grounds [21]. With regard to wild animals in the discussed area, foxes constituted over a half (58.57%) of rabid animals, which constitutes a general tendency. Raccoons were in the second place; in Warmian-Mazurian province decidedly the highest number of infections is found in this species of animals in comparison to the rest of the country, which was observed by Mól while he analyzed the occurrence of rabies in Poland in the years of 1965-1998 [13].

In the years of 1999-2000 in Warmian-Mazurian province 187 145 vaccine baits for foxes were distributed, out of which 95 180 in 1999 and 91 965 in 2000. Generally, 11 129 461 vaccines were distributed in the whole area of the country during that period. The smallest number was applied in Lublin and Warmian-Mazurian provinces [14]. Rabies was successfully controlled in the western part of Poland, included in oral vaccines for foxes since 1993, and bordering on the countries where strict immunization of wild animals has been conducted for many years. Undoubtedly, mass vaccination of foxes as well as limiting the number of loitering domestic animals might diminish the rabies threat [4]. According to Mól [14], vaccination of foxes should be supplemented with support for preying birds and raven-like birds, which feed on rodents, since field-voles and mice significantly contribute to the increase of fox population [10].

The decrease of infection incidence in animals, however, does not correspond to the decrease of vaccinations in humans, since the majority of them are exposed to animals with potential rabies [19]. In 1999 in Warmian-Mazurian province, 146 animals were the cause of vaccination in humans, and only 14 of them were finally diagnosed as rabid; in the year 2000, 167 animals were the cause of vaccination, while only 29 of them were found rabid in laboratory tests (table 2). In 1999, 243 individuals reported to Epizootic Diseases' Clinic of the Provincial Specialist Hospital in Olsztyn suspecting themselves of the possibility of infection with the rabies virus; 154 of them were qualified for vaccination. In the year 2000, there were 334 of such individuals, and 194 of them were qualified for vaccination (table 3). As a result of a physician's decision (made on the basis of a negative result of the animal observation) or at the patient's request, in 94 cases of patients (49 in 1999 and 45 in 2000), further vaccinations were abandoned. In case of 230 individuals (95 in 1999 and 135 in 2000) the vaccinations were completed.

In the year 2000, in Warmian-Mazurian province as a result of being bitten by a rabid cat, his owner, who did not report for vaccination, died. It has been the only such case in Poland for 15 years [25].

Table 2. Number of animals suspected and infected with rabies, which caused qualification for vaccination of individuals who had contacts with them

Year	Domestic animals (heads)		Farm animals (heads)		Wild animals (heads)		Total (heads)	
	Suspected of rabies	With found rabies	Suspected of rabies	With found rabies	Suspected of rabies	With found rabies	Suspected of rabies	With found rabies
1999	126	2	6	6	14	6	146	14
2000	128	10	19	14	20	5	167	29
Total	254	12	25	20	34	11	313	43

Table 3. Number of individuals qualified for vaccination against rabies and hospitalized in Warmian-Mazurian province in the years of 1999-2000

Year	Reported for vaccination (number of individuals)	Not qualified for vaccination (number of individuals)	Qualified for vaccination (number of individuals)				Total (number of individuals)
			Further vaccinations abandoned	Vaccinations completed	No information whether the vaccinations were completed	Hospitalized	
1999	243	89	49	95	7	3	154
2000	334	140	45	135	14	-	194
Total	577	229	94	230	21	3	348

CONCLUSIONS

1. Intense forestation of the north-eastern part of the country as well as favorable atmospheric conditions constitute protection of the natural habitat of the fox and other wild animals, which undoubtedly contributes to so high incidence of rabies among animals in Warmian-Mazurian province.
2. Increasing the number of distributed vaccines might diminish spreading of the rabies virus among the fox population.
3. Compulsory vaccination of cats and limitation of the number of loitering domestic animals might decrease the threat of rabies.
4. It is also necessary to make the society aware, in a broad sense, about the danger involved in being bitten by animals as well as about the fact that the only effective method of overcoming the rabies virus is active or passive immunization, under the condition that it is conducted as quickly as possible after the exposure.

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