nasal swab, blood, serum and CSF. Rabies tissue culture infection testing was performed from CSF, skin, nasal, conjunctival and pharyngeal swabs. Rabies virus specific neutralising antibody testing was performed from serum samples.

Results

On 8 September a first positive result for lyssavirus RNA by RT-PCR on a punch biopsy of the neck skin was reported by the Centro Nacional de Microbiología, Instituto de Salud Carlos III (Madrid, Spain). On 9 September, rabies infection was confirmed by FAT and IHC of punch biopsy of the neck skin by the National Reference Laboratory for Rabies (Österreichische Agentur für Gesundheit und Ernährungsicherheit, Institut für Veterinärmedizinische Untersuchungen, Mödling). On 23 September the Austrian Ministry of Health was informed by the Centro Nacional de Microbiología, Instituto de Salud Carlos III that a rabies virus genotype 1 of North African origin had been found by sequencing of a 400 bp fragment of the nucleoprotein gene. Thus, FAT, IHC and RT-PCR (including sequencing) of the neck skin, and the RT-PCR (including sequencing) of the pharyngeal swab all gave positive results. In contrast, RT-PCR of other samples (blood, serum, CSF, nasal swab), and rabies tissue culture infection test (CSF, skin, nasal, conjunctival and pharyngeal swabs) did not provide positive results. Rabies virus-specific neutralising antibodies were undetectable in the first serum sample collected during the first week of September and were present in a concentration of 52 IU/ml in the second serum drawn on 21 September. Since the patient had also received several shots of anti-rabies vaccine at that time, interpretation of these data is difficult.

Discussion

Rabies infection usually is confirmed by post-mortem diagnosis of the suspected animal [2]. However, in vivo diagnosis in humans is also possible nowadays [3,4].

In Austria, the last human rabies case was reported in 1979. Animal rabies, oral vaccination campaigns for foxes are taking place in the areas of Burgenland, southern Carinthia and Styria, as well as several parts of Lower Austria, in order to prevent rabies outbreaks due to foxes crossing the borders from neighbouring countries. The last rabies infection to be detected in a fox was reported in May 2004 in Carinthia, and was found to be vaccine related [5]. In contrast to information reported in ProMED mail on from 3 September 2004, the rabies-infected dog in the case reported here was not brought from Austria to Morocco [6]. Rabies is endemic in Morocco, and cases in that country are regularly to the World Health Organization. The latest available data are from 1999 and report 599 animals positive for rabies infection [7].

Since 1990 the number of human rabies cases reported in Europe declined from 22 to 7 [8]. Rare reports of travel-related human cases are occasionally reported from rabies-free countries [9]. This Austrian case of laboratory confirmed rabies highlights the urgent need for reinforcement of the international recommendations for travel vaccinations and post exposure treatment. The case was communicated through the EU's Early Warning and Response System to the EU member states by the ministries of health in both Spain and Austria. Additionally, rabies information sheets were distributed in Austrian airports warning travellers of the danger of illegally importing animals, and informing them of the need for immediate medical care for unvaccinated persons who have been bitten by animals in rabies-endemic countries.

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ORIGINAL ARTICLES

Surveillance report

RABIES SURVEILLANCE, TRENDS IN ANIMAL RABIES AND HUMAN POST-EXPOSURE TREATMENT IN POLAND, 1990 - 2004

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This paper describes recent changes in the epizootical and epidemiological situation of rabies in Poland. Analysis of routine surveillance data on animal cases and human post-exposure treatment was performed in order to examine the impact of introduction of cell culture vaccine for human use and the implementation of the fox immunisation programme. The success of the immunisation programme for wild animals has become evident during the past 3 years, as a 9-fold decrease in animal rabies cases has been observed. To date, however, the downward trend in animal rabies cases has had no effect on the frequency of administration of the post-exposure treatment for humans. Moreover, two cases of locally acquired human rabies have occurred in patients who did not receive post-exposure vaccination. These cases prove that rabies should be still considered a public health concern in Poland.

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Introduction

Rabies is a notifiable disease within both the public health and veterinary surveillance systems in Poland. Terrestrial rabies posed a serious problem in Poland in the 20th century, but within the past decade the epidemiological situation has started to change [1]. Three key factors in the strategy for the elimination of rabies have exerted a major influence both on the pattern of animal rabies and on the risk of human rabies. These include the introduction of mass vaccination of dogs in 1950, introduction of safe and immunogenic cell culture based vaccine in 1984 and the introduction of mass oral immunisation of foxes in 1993. The immunisation programme for foxes was implemented in 1993 on the western border and was then successively expanded eastward to cover the entire territory of Poland in 2002 [2].

Following the implementation of oral immunisation programmes of foxes in various European countries, rabies in terrestrial animals was eliminated in some countries and dramatically reduced in others [3]. The problem of and interest in bat rabies has become more significant.

Two genotypes of rabies virus have been isolated in Polish territory: genotype 1 (classical rabies virus) from terrestrial animals and genotype 5 (European Bat Lyssavirus type 1, EBLV1) from bats. Moreover, diversity within the genotype 1 cluster has been observed. Polish strains belong to four different phylogenetic groups of genotype 1 rabies virus present in Europe. Strains from two of the phylogenetic groups are dominant in Polish territory and their geographic spread is strictly dependent on the geographical barrier of the Vistula River. The north-eastern European (NEE) group is limited to the eastern side of the Vistula river, and the central European (CE) cluster has been isolated mainly in the west and south of Poland - on the west side of the Vistula river [4].

The purpose of this article is to highlight the recent changes in the epizootiology and epidemiology of rabies in Poland.

Methods

Data used in this study came from two sources. Cumulative data on annual number of animal rabies from the Veterinary Inspectorate were used to evaluate the epizootiological situation of rabies. In Poland, only laboratory confirmed animal rabies cases are reported. Fluorescent antibody test (FAT) is routinely used for diagnosis of rabies. Assessment of the public health hazard and human exposure to rabies were based on information derived from the routine infectious disease surveillance system. Surveillance data on human rabies and administration of post exposure treatment against rabies, collected by the National Institute of Hygiene, consist of annual cumulative numbers from 1964 to 2004 and individual detailed reports on persons vaccinated against rabies from 1990 to 2003.

Results

Animal rabies

Between 1990-2003, foxes (*Vuples vulpes*) were the main reservoir and source of rabies in Poland, as they were during the preceding two decades. They represented between 60% of all infected animals in 2003 (233/390), 69% in 2002 (822/1188), and 74% in 2001 (2241/3037) [Figure 1]. The second most important host species were racoon dogs (*Nyctereutes procyonoides*). In recent years the percentage of racoon dogs among all infected animals appears to be increasing, although substantial fluctuations are present. The influence of oral immunisation programme of foxes introduced in 1993 became clear from 2002 [Figure 1]. The number of cases in 2004 (136 cases) was nine fold lower compared with 2002 (1188) and 17-fold lower than the median annual number of cases during 1990-2001 (2294.5).

The proportion of infections occurring in domestic animals varied between 17% and 23% of the total number of cases of animal rabies. Rabies in domestic animals is closely related to rabies in foxes and racoon dogs. Between1990–2003, no cases in domestic animals were reported in territories where no cases of rabies in wild animals occurred in the same year.

Until 1998 only 4 cases of bat rabies had been reported in Poland. However, in recent years, several cases have occurred every year. The annual number of rabid bats reported in 1998-2004 varied between 4 in 1999 to 14 in 2001 and 10 in 2004. Although the numbers are not high, their relative importance is increasing [Figure 2].

Figure 2

Percentage of foxes, racoon-dogs and bats among animal rabies cases in Poland, 1990-2004

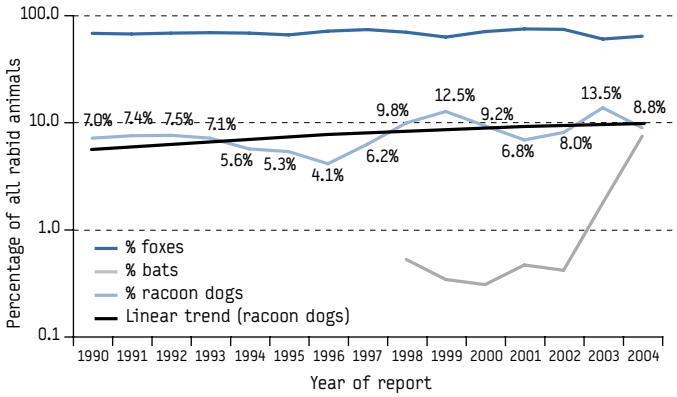
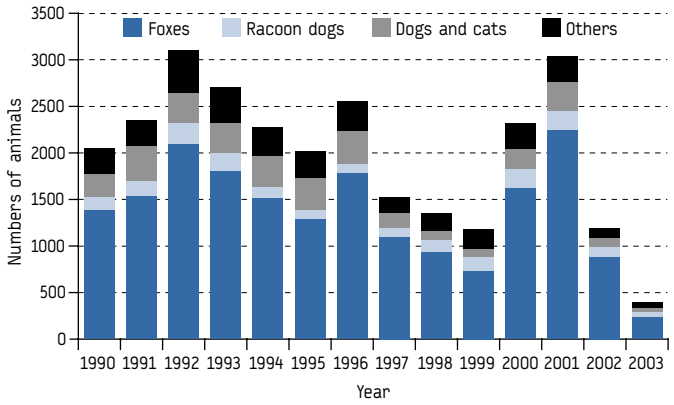


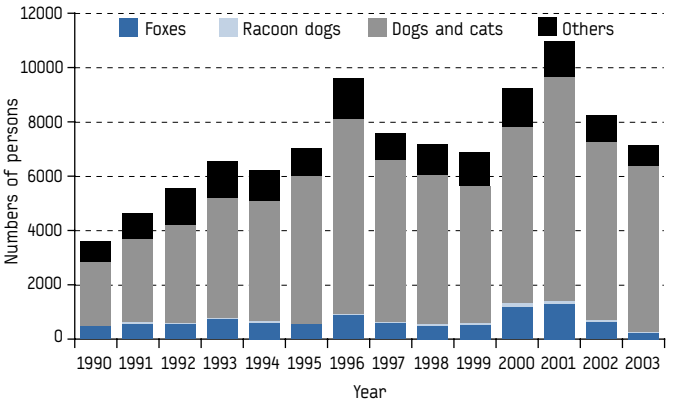
Figure 1

Animal rabies in different species and human exposures leading to vaccination, in Poland, 1990-2003

A. Number of animal rabies cases, by species



B. Number of persons vaccinated against rabies after exposure to different animal species



Human rabies

No human cases occurred between 1985 and 2000 in Poland. Then two deaths were reported - in 2000 and 2002. Both infections were acquired in Polish territory. The first case occurred in a 59 year old woman in northeast Poland who was bitten on the finger by her cat in 2000. The second case occurred in a 28 year old man in southern Poland in 2002, who was most probably exposed to a wild animal. The strains of rabies virus isolated from both cases belonged to genotype 1. The first one represented the phylogenetic group north-eastern Europe (NEE) and the second one the central European (CE) group. Neither patient received either pre- or post-exposure prophylaxis.

Human post-exposure treatment against rabies

In Poland, a country of approximately 38 millions inhabitants, post-exposure treatment is administered to approximately 7000 persons annually. The individual reports sent to the National Institute of Hygiene from 1990 to 2003 cover approximately 90% of all persons vaccinated against rabies. Of the 100 395 persons vaccinated against rabies in this time period, only 26% were immunised following exposure to animals definitively confirmed to be rabid; 64% were immunised following exposure to animals in which rabies could neither be ruled out nor confirmed.

The proportion of different animal species to which humans are exposed is unrelated to their distribution among all reported rabid animals in Poland. Rabid dogs and cats, constituting about 12% of all infected animals, were the reason for vaccination for 74% of the total number of vaccinees [Figure 1].

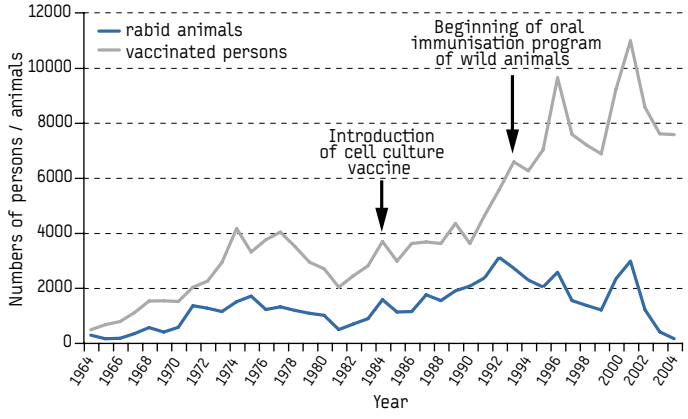
Contact with rabid foxes, which represent 68% of rabid animals, were the reason for vaccination for only 9% of the total number of vaccinees. Moreover, in the case of red foxes, indirect contact (e.g. contact with a dog bitten by a fox), touching and contact with saliva were the most common types of exposure (88%), leading to human vaccination. Exposures among vaccinees to dogs and cats were most often associated with bites (83%).

Impact on post-exposure treatment

Figure 3 shows time trends in the numbers of vaccinated people, compared with the number of cases of animal rabies. The impact of two important events on the number of post-exposure treatments administered was considered. Firstly, in 1984, a highly immunogenic and safe cell-culture vaccine against rabies was introduced for human use. Secondly, in 1993, mass oral rabies vaccination of foxes was implemented. From the introduction of the cell culture vaccine the number of vaccinated people increased. This trend has continued in recent years, although a considerable decrease in animal rabies cases was already apparent.

Figure 3

Trends in number of animal rabies cases and number of post-exposure treatments administered in Poland, 1964-2004



Discussion and conclusion

Routine surveillance data confirm a decreasing trend in animal rabies, which is a consequence of the implementation of the fox immunisation programme. At the same time, an increase of rabies reservoirs other then fox host species has been observed, which merits further attention and is currently being investigated. One important example is the increasing importance of bat rabies, while terrestrial rabies incidence is falling. At the present time it is difficult to determine whether there is a real increase of rabies infection in bats, or whether this observation results from greater attention given by the public health authorities.

Public attention and fears currently seem to be most focused on foxes as the source of rabies. This is supported by the fact that the majority of human post-exposure treatments are administered following low risk contact such as being licked by a fox, or even having indirect contact with foxes.

In contrast, dogs and cats either known or suspected to be rabid were responsible for most of the bites and abrasions. This underlines the importance of preventive vaccination of these animals against rabies and their potential influence on the human hazard. Immunised dogs and cats create a protective barrier between wild animals and humans. This was once again confirmed by the recent case of human rabies in a person exposed to a cat.

Recent human cases show that the risk of becoming infected on the Polish territory is still present. Additionally, new risk factors have emerged, such as travel to rabies endemic areas. Based on the situation in France, the United Kingdom and Germany, where animal rabies is eliminated or well controlled, we may expect that in the near future cases of human rabies will be imported rather then acquired in Poland [5,6,7]. In conclusion, rabies should still be considered a public health concern in Poland. Moreover, there is a need to fill the existing gaps in public awareness about rabies.

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