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LONG-TERM MONITORING FOR ORNITHOSIS – PSITTACOSIS AND MAMMALS CHLAMYDIOSIS IN ANIMALS IN SLOVAKIA

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Chlamydiae are widely distributed throughout the world, causing various disease forms in animals and humans. The most important species, which can be pathogenic for humans, are Chlamydophila psittaci, causing ornithosis-psittacosis in birds, Chlamydophila abortus, causing abortion in ruminants and Chlamydophila felis, causing upper respiratory tract infections in cats. The study presents the results of a five-year monitoring of ornithosis-psittacosis and mammals chlamydiosis in various species of animals. Altogether 46 903 blood sera were examined for the presence of antichlamydial antibodies using the complement-fixation method. Out of this number, 3 035 (6.5%) samples reacted positive. Long-term high positivity was detected in sheep, but also other animal species showed positive results.

Key words: complement fixation test, mammal chlamydiosis, ornithosis-psittacosis, seroprevalence

INTRODUCTION

Each country has its own legislative provisions which list the diseases that have to be reported to the relevant authorities. The mechanism for the incorporation of notifiable diseases into the legislation must be flexible enough to quickly include additional diseases.

Law on veterinary care in the Slovak Republic was enacted in 2007 (Law on Veterinary Care N^{o} 39/2007 Code of Law of the Slovak Republic). The third article of this Law comprises veterinary requirements for animals, hatching eggs and embryonic products. In relation to this are included requirements on disease control, notification of animal diseases, identification and registration of animals, movement of animals, hatching eggs and health requirements related to embryonic products. The owner or keeper of animals is obliged to notify the relevant veterinarian body about the suspicion or occurrence of the following diseases: *Aphtae epizooticae, Pestis suum, Febris catarrhalis ovium, Pestis*

equorum, Influenza avium, Morbus Newcastle, Fish and Mollusc diseases, zoonoses and causative agents in animal products which can cause foodborn infections or food intoxications. In the case of chlamydial infection there is only the EU legal standard – Commission Decision 2000/666/EC. This decision is related to the import of birds other than poultry from third countries and is primarily concerned with the prevention of Newcastle disease and Avian influenza. However, chlamydiosis is a disease affecting not only birds. Many other species of animals can be infected by the chlamydial agent.

Chlamydiae, unusual obligatory intracellular bacteria, are members of the family *Chlamydiaceae.* They are considered Gram negative due to their relationship with other Gram negative bacteria, but are difficult to stain with the Gram stain. On the basis of analysis of ribosomal RNA a new genus *Chlamydophila* (Everett *et al.,* 1999) was established in 1999. This genus incorporates 6 species – *Chlamydophila psittaci, Chlamydophila abortus, Chlamydophila felis, Chlamydophila pneumoniae, Chlamydophila caviae,* and *Chlamydophila pecorum,* from which the first three have zoonotic character. They can be transmitted by ingestion, inhalation of infected aerosol and also by direct contact with the infected animals.

The present study summarises the results obtained during a 5-year study of ornithosis-psittacosis and chlamydiosis in animals originating from the Slovak Republic.

MATERIALS AND METHODS

During the five years period (2004 – 2008), serological examination for the presence of antichlamydial antibodies was carried out on 46 903 blood samples from various species of animals, including 30 513 cattle, 14 979 sheep, 914 goats, 40 pigs, 34 birds, 82 cats, 75 dogs, 228 rabbits and 38 horses. The samples were examined at 6 State Veterinary Institutes in the Slovak Republic (Bratislava, Nitra, Dolný Kubín, Zvolen, Košice, and Prešov), and the results were processed and evaluated in the Reference Centre of Slovak Republic for ornithosis – psittacosis and mammals chlamydiosis. Blood samples were obtained from animals during routine examinations in order to identify the aetiology of reproductive defects on the occasion of a transport or auction – sales, before sales, in quarantine, and also in order to identify the source of human chlamydiosis. Serological diagnostics was performed also in a group of cattle, sheep, and goats after abortion.

Micro and macro-method of complement fixation (CF) test recommended by OIE in Paris, was used as the diagnostic method to determine specific antichlamydial antibodies. This test is specific for the family *Chlamydiaceae* without discriminating between different species of either *Chlamydia* or *Chlamydophila.* The animals with positive serum reaction at the titre 1:64 and higher were considered positive.

RESULTS

Out of 46 903 sera tested, 3 035 (6.5%) samples reacted positively.

In 2004, serological examination was conducted on 10 689 animal blood samples (Table 1). Antichlamydial antibodies were detected in 472 cases (4.4%).

Table 1. Seroprevalence of antichlamydial antibodies in animals in Slovakia in 2004

Species	Total of examined animals	Positive	
		N	%
Cattle	7 546	90	1.2
Sheep	2 591	363	13.6
Goats	379	11	2.9
Pigs	14	0	0
Birds	21	8	38.1
Cats	11	0	0
Dogs	8	0	0
Rabbits	104	0	0
Horses	15	0	0
Total	10 689	472	4.4%

In 2005, antichlamydial antibodies were detected in 1 396 out of the total number of 11 077 examined samples (Table 2). The comparison of incidence in 2004 and 2005 confirmed a significant increase from 4.4% to 12.6%.

Table 2. Seroprevalence of antichlamydial antibodies in animals in Slovakia in 2005

Species	Total of examined animals	Positive	
		N	%
Cattle	7 461	831	11.14
Sheep	3 410	543	15.92
Goats	162	17	10.49
Pigs	11	0	0
Dogs	13	0	0
Cats	14	2	14.28
Horses	3	3	100
Birds	3	0	0
Total	11 077	1 396	12.6%

In 2006, from the 10 490 blood sera 482 were positive (Table 3). The total percentage of positive animals decreased from 12.6% in 2005 to 4.6% in 2006.

Table 3. Seroprevalence of antichlamydial antibodies in animals in Slovakia in 2006

Species	Total of examined animals	Positive	
		N	%
Cattle	6 863	112	1.63
Sheep	3 451	369	10.69
Goats	121	1	0.82
Pigs	9	0	0
Dogs	24	0	0
Cats	13	0	0
Horses	4	0	0
Birds	5	0	0
Total	10 490	482	4.6%

In 2007, a total of 12 526 blood samples were examined, from which 486 were seropositive. The incidence of positive animal blood samples decreased from 4.6% in 2006 to 3.9% in 2007 (Table 4).

Table 4. Seroprevalence of antichlamydial antibodies in animals in Slovakia in 2007

Species	Total of examined animals	Positive	
		N	%
Cattle	7 461	85	1.1
Sheep	4 675	399	8.5
Goats	207	1	0.5
Pigs	6	0	0
Dogs	23	0	0
Cats	13	0	0
Horses	14	1	7.1
Birds	3	0	0
Rabbits	124	0	0
Total	12 526	486	3.9 %

In 2008, only 2 121 blood sera were examined. Antichlamydial antibodies were detected in 199 cases, which corresponded to 9.4% (Table 5).

Table 5. Seroprevalence of antichlamydial antibodies in animals in Slovakia in 2008

Species	Total of examined animals	Positive	
		N	%
Cattle	1182	9	0.76
Sheep	852	187	21.95
Goats	45	0	0
Dogs	7	0	0
Cats	31	3	9.68
Horses	2	0	0
Birds	2	0	0
Total	2121	199	9.4 %

DISCUSSION

Zoonoses, which are defined as diseases transmissible from animals to humans, are among the most important animal and public health problems that affect the well-being of societies worldwide. Of the 1 415 human pathogens 868 (61%) are know as zoonotic (Taylor *et al.,* 2001). This group comprises also some chlamydial species which can be pathogenic for humans: *Chlamydophila psittaci,* causing ornithosis – psittacosis in birds, *Chlamydophila abortus,* causing abortion in ruminants, and *Chlamydophila felis,* causing upper respiratory tract disease in cats. In former times, the presence of chlamydial infections was mostly reported in relation to acute illness (Reggiardo *et al.,* 1989; Wittenbrink *et al.,* 1993), but with improvement of diagnostic methods this infection was diagnosed also in asymptomatic animals. Latent chlamydial infections occur under natural conditions in birds, cattle, sheep, and goats. These animals can be the source of infection for other animals, but also for humans. Therefore, is important to perform screening examinations in potentially infected animals. Infections caused by these pathogens are widespread around the world. Also in Slovakia, the presence of antichlamydial antibodies has been reported in many species of animals, including cows (Čisláková *et al.,* 1999; Trávniček *et al.,* 2000), pigs (Čisláková *et al.,* 1999), sheep (Sádecký *et al.,* 1978; Čisláková *et al.,* 1999), goats (Čisláková *et al.,* 1999), horses (Čisláková *et al.,* 1999), dogs (Kociánová *et al.,* 1982), cats (Trávniček *et al.,* 2002a), small rodents (Čisláková *et al.,* 2001; Čisláková *et al.,* 2004) and birds (Čisláková *et al.,* 1998; Trávniček *et al.,* 2002b).

The most important species, which can be pathogenic for humans, are *Chlamydophila psittaci*, causing ornithosis-psittacosis in birds, *Chlamydophila abortus,* causing abortion in ruminants, particularly in sheep, goats, and cattle, and *Chlamydophila felis,* causing respiratory diseases in cats. All three species mentioned have a zoonotic character as their occurrence was described also in humans.

During the years 2004 – 2008, 46 903 sera from different animal species were examined for the presence of antichlamydial antibodies. These animals originated from all parts of Slovakia. Most of the examined animals were cattle, sheep, and goats and other species were examined only sporadically. On average, 11 195 ± 919 animals were examined in the period of 2004 – 2007. The situation changed abruptly in 2008 when only 2 121 animals were examined serologically. The Slovak Republic policy for veterinary prevention and protection of the state territory in 2008 did not specify that aborting animals (cattle, sheep goats) have to be examined regularly for this disease. Serological examination for the presence of specific antibodies and particularly for observation of their dynamics for the purpose of determination of aetiology of reproduction disorders and other health problems were conducted at the expense of breeders or were indicated before auctions, sales and in quarantine when requested by owners of these animals. Despite all this, it is very important that while the number of examined animals decreased 6-fold in comparison with 2007, the total serological positivity of examined samples increased 2.5–fold.

Relatively high positivity was detected every year in sheep in comparison with other species of animals. During the 5-year monitoring, from a total of 14 979 examined sheep 1861 were positive (12.4%). Antichlamydial antibodies were frequently detected in titres 1:512 – 1:4096 which are the levels often detected in cases of abortion suspected of being caused by chlamydia. Enzootic abortions caused by *Chlamydophila abortus* are observed mainly in sheep and goats, occasionally in cattle, deer, and llamas, but their occurrence has also been reported in rabbits, horses, and mice. The pathogen can also induce abortions in pregnant women after contact with aborting sheep or goats (Mare, 1994; Rodolakis *et al.,* 1998; Pospichil *et al.,* 2002; Aitken, 2007). In non-pregnant individuals *C. abortus* can cause severe respiratory disorders. Infected ewes can give birth to live, clinically healthy lambs which may carry the infection.

As mentioned earlier, *Chlamydiae* are widely distributed throughout the world and cause various forms of disease in animals and humans. Several species are known to be transmissible from animals to humans. But only avian chlamydiosis (ornithosis-psittacosis) is a disease notifiable to the OIE. The results obtained during our five-year study indicate that chlamydia are still present in Slovakia, not only in birds but also in other species of animals, including sheep, goats, cattle, rabbits, cats, and horses. Therefore, it is important to perform a screening examination of these animals in order to reduce or interrupt the spreading of this disease and to prevent transmission to humans. Relevant is also the fact that chlamydial infections in animals are of considerable economic significance worldwide.

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DUGOTRAJNI MONITORING ORNITOZE-PSITAKOZE I HLAMIDIOZE SISARA KOD ŽIVOTINJA U SLOVAČKOJ

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SADRŽAJ

Hlamidije su široko raspostranjene po svetu i izazivaju različita oboljenja kod ljudi i životinja. Najvažnije vrste, koje mogu biti patogene za ljude, su *Chlamydophila psittaci* koja izaziva ornitozu-psitakozu kod ptica, *Chlamydophila abortus* koja uzrokuje pobačaj kod preživara i *Chlamydophila felis* koja dovodi do oboljenja gornjih partija respiratornog trakta mačaka. U ovom radu su prikazani rezultati petogodišnjeg monitoringa ornitoze-psitakoze i hlamidioze sisara kod različitih vrsta životinja u Slovačkoj. Ukupno je na prisustvo anti-hlamidijalnih antitela, metodom fiksacije komplementa, analizirano 46 903 uzoraka krvnog seruma. Od ovog broja, 3 035 (6,5%) uzoraka je reagovalo pozitivno. Dugotrajne pozitivne reakcije su posebno registrovane kod ovaca.