Cryptosporidiosis and giardiasis in western Romania: animal source – reservoir of infection for the human population

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Abstract. Cryptosporidiosis and giardiasis (lambliosis) are parasitic diseases predominantly of the small intestine, found in several species of animals and humans and caused by species of the genera Cryptosporidium and Giardia. Both diseases may have zoonotic character.

In Western Romania, cryptosporidiosis has been investigated especially in the past 20 years. The recorded high prevalence value of the disease and the Cryptosporidium spp. identification at a large number of animals highlighted a large variety of the infection sources for human population. Molecular epidemiology studies conducted in the last five years revealed in animals parasitism with some zoonotic species. Also, the identification of animal adapted species in humans reveals the importance of animals as reservoirs of infection.

Giardiasis, until five years ago, has been sporadically diagnosed in animals in Western Romania. Recently conducted researches showed a worrying prevalence of this protozoan in animals, the disease being diagnosed in several species of livestock, pets and wildlife. Molecular studies revealed the presence of species and assemblages with zoonotic potential.

Keywords: Cryptosporidium; Giardia; Zoonosis.

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Introduction

Cryptosporidiosis and giardiasis (lambliosis) are mainly parasitic diseases of the small intestine, found in several species of animals and humans, caused by species of the genera Cryptosporidium and Giardia. Both diseases are zoonotic, have worldwide spreading and can have various clinical developments from subclinical to sporadic or epidemic, both in humans and animals (Ryan et al., 2014).

Cryptosporidiosis

If at first, for Cryptosporidium genus a single species namely C. parvum (Tzipori et al., 1980),
has been recognized, currently there are 26 valid species and several other invalid species and genotypes (Ryan et al., 2014). Molecular studies have demonstrated the existence of several species and genotypes. Although they have large host specificity, usually, Cryptosporidium have a higher specificity for the species in which preponderant development is present. In humans, out of all the valid species, C. hominis, the species derived from C. parvum, is specific and adapted. The other species identified in animals have lower or higher zoonotic potential.

Prevalence of cryptosporidiosis in livestock

First identification of cryptosporidiosis in animals occurred after the '80 (Dan et al., 1983). In the next decade, for the first time in western Romania, the disease has been identified in cattle aged between one day and two years, with a prevalence from 38.4% (Dărăbuş, 1996) to 32.3% (Dărăbuş et al., 2008). Later, Dărăbuş et al. (2009a), in a study conducted in 25 farms in western Romania, found a prevalence of 41.6% in calves aged less than six months and parasitism with Cryptosporidium spp. has proved to be the most important agent of neonatal diarrhea. A prevalence of 9.09% of cryptosporidiosis in young sheep before weaning (Imre, 2010) in several localities in the western part of Romania demonstrates that Cryptosporidium spp. has an important place among the enteropathogens found in this area in sheep. In Romania, the first case of infection with cryptosporidia in pigs is reported in 1994 by Dărăbuş in a pig intoxicated with salt, after microscopic examination of ileal mucosa smears (Dărăbuş, 1996). In the large industrially reared pigs from western Romania, a prevalence value ranged from 27.7% (Imre, 2010) to 31% (Dărăbuş et al., 2009b) was identified using the ELISA technique.

Prevalence of cryptosporidiosis in humans

In the West and South-West of Romania, epidemiological investigations of cryptosporidiosis revealed variable prevalence values from author to author depending on the study design and the diagnostic method used. Using Ziehl-Neelsen staining technique modified by Henricksen, Mederle et al. (2009), after processing a total of 421 fecal samples, found a prevalence of 4.03%. In another study Popovici et al. (2009) using ELISA technique (BIO K070 kit) in 221 people, adults and children, obtained a prevalence of 2.26%.

Prevalence of cryptosporidiosis in birds

Between 1988 and 1995, in a study which included 893 chickens, 27 turkeys and 23 partridges, cryptosporidiosis was identified only in broiler chickens in proportions that varied between 22.5% and 25.2% (Dărăbuş, 1996). In a study conducted 15 years later, protozoan Cryptosporidium spp. was not identified in broiler farms, probably due to the high level of biosecurity and excellent growing conditions (Imre, 2010).

Molecular biology studies in western Romania

If 20 years ago very little was known about the epidemiology of cryptosporidiosis and the situation in western Romania, currently the protozoan was identified in several species of animals and people. Moreover, the team of researchers from the Faculty of Veterinary Medicine Timişoara conducted molecular biology research on samples taken from cattle, sheep and humans to identify species and genotypes of Cryptosporidium (Imre et al., 2009; 2010a; 2010b; 2011; 2012; 2013). In calves two species: C. parvum (IlaA15G2R1 and Subtypes Subtypes IlaA15G2R1) (Imre et al., 2011) and C. bovis (Imre et al., 2012) have been identified. It is known that Ila subtypes have been identified in humans mainly subtypes IlaA15G2R1. Their presence suggests that cattle may be a reservoir of infection for humans (Santin and Trout, 2008).

In lambs five subtypes of the species C. parvum namely IlaA17G1R1, IlaA16G1R1, IldA20G1, IldA24G1 and IldA22G2R1 were found (Imre, et al., 2010a; 2013). Ila and Ild subtypes isolated from sheep, considered by many authors with zoonotic potential were identified in humans and may be, in the western part of Romania, an important source of infection, especially in the area with intensive sheep
growth. Two other species have been characterized in lambs: *C. ubiquitum* (formerly known as *C. cervine* genotype) and *C. xiaoi* (previously recognised as *C. bovis*-like genotype) (Imre et al., 2013). In humans, in an early study have been shown the presence of the species: *C. parvum* and *C. ovine* genotype (Imre et al., 2010b).

**Giardiasis**

Over the years there have been proposed several names for the disease causative agent, like *Giardia lamblia*, *Giardia duodenalis* or *Giardia intestinalis*. These three names are now used in parallel, with some regional and personal preferences (Adam, 2001). Until today, although *Giardia* species were named according to the species that has been isolated, only six species are recognized as valid and many assemblages numbered from A to G.

**Prevalence of giardiasis in livestock**

A study on calves, aged from four days to nine months, revealed a prevalence of 18.84% (117/621) by Lugol's iodine staining method and a prevalence of 38.48% (239/621) by ELISA method (Sorescu, 2013). In western Romania, in 50 goats White of Banat breed, *Giardia* spp. was not identified but the same author found an infection prevalence of 42.85% on a farm in the county of Maramureș in Alpine France breed imported from France. The age of kids infected ranged between one week and three weeks (Sorescu et al., 2011).

In another study, the prevalence of *Giardia* spp infection in lambs in the west of Romania was 70.24% (432/615) using ELISA method and 58.37% (359/615) using Lugol's iodine staining method. In pigs, *Giardia* spp. has been identified only in extensive production system, with a prevalence of 20.68% (Sorescu, 2013).

**Prevalence of giardiasis in domestic carnivores**

Depending on the diagnoses method used, the prevalence of infection with *Giardia* spp. in dogs, in western Romania, was different: 46.64% (250/536) by Lugol's iodine staining method, 44.29% (134/321) at rapid tests and 47.44% (102/215) by ELISA test were only samples from shelter and kennel were analyzed. As risk factors for infection with *Giardia* spp., race, age and living conditions, were identified (Sorescu, 2013).

In cats, the prevalence of *Giardia* spp. infection by rapid tests was 42.80% (113/264) and by Lugol's iodine staining method 25% (66/264) (Sorescu et al., 2012). Giardiasis in dogs has been identified as the only pathogen agent and in combination with *Cryptosporidium* spp., *Isospora* spp., *Toxocara canis*, *Ancylostoma caninum* and *Trichocephalus vulpis* (Sorescu et al., 2010).

**Prevalence of giardiasis in wildlife**

In wildlife studies for the identification of *Giardia* spp. were performed only for roe deer and foxes. In roe deer after analyzing the 96 samples by ELISA a positivity of 37.50% was found (36/96). In foxes in the 20 examined samples a prevalence of 25% was found (Sorescu, 2013).

**Molecular biology studies in western Romania**

For the identification of *Giardia* spp. in western Romania the "nested PCR" technique was used. In sheep *Giardia intestinalis* assemblage D (dog genotype) and *Giardia intestinalis* assemblage E (sheep genotype) were identified. In samples from dogs, assemblage D specific for dog was found. The assemblage D can be transmitted from dogs to other hosts (Sorescu, 2013).

Several studies (Foronda et al., 2004; Gelanew et al., 2007; Traub et al., 2009) showed that assemblages A and B are most commonly found in humans, and also the assemblages C, D, E and F of *G. intestinalis* were reported. The presence of human assemblages A and B in animals (Traub et al., 2009; Sprong et al., 2009) makes them an important reservoir of infection for the human population.

**References**


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