Epidemiology of *Cryptosporidium* spp. infection in goat kids in the central and the northwest part of Romania

Epidemiologia infecţiei cu *Cryptosporidium* spp. la iezi în centrul şi nord-vestul României

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ABSTRACT

412 fecal samples from goat kids coming from 12 different goat farms from the central and northwest of Romania were examined. The samples were processed through Ziehl-Neelsen stain, modified by Henricksen. Cryptosporidiosis prevalence in goat kids between one day and 6 weeks of age was 24% (99/412). Oocysts elimination was observed in 82,5% of the goat kids with diarrhea and 13,5% of the goat kids without diarrhea. The highest prevalence of cryptosporidiosis was observed at the age 1-2 weeks (39,4%) and 2-3 weeks (30,2%) respectively ($p< 0,00001$). The distribution of cryptosporidiosis according to sex was uniform ($p< 0,49$). This study demonstrates that *Cryptosporidium parvum* is one of the main biotic agents involved in neonatal diarrhea in goat kids from central and northwest part of Romania.

Keywords: *Cryptosporidium,* goat kid, oocysts, epidemiology, diahreea

Introduction

Cryptosporidiosis is a disease found in animals and humans, with favorable evolution in immunocompetent organisms and severe evolution in immunodeficiency organisms, characterized clinically mainly by gastrointestinal disorders and less commonly by the respiratory, liver and pancreas disorders. The disease has a zoonotic character, as is transmitted from animals to humans. Cryptosporidiosis occurs in all systems of growth and produces large economic losses, especially when the etiologic agent is involved in triggering neonatal diarrhea.

Cryptosporidiosis in goats was first reported in 1981, in a 2 week old goat kid with diarrhea, in Australia (Mason et al., 1981). In goats, infection with *Cryptosporidium spp.* is considered extremely important economically, because it produces losses, but also in terms of health, due to its zoonotic character. Natural infection with *Cryptosporidium parvum* in goat kids resulted in a 2 kg of body weight difference at 4 weeks between same age sick and healthy goat kids (De Graaf et al., 1999).

Molecular data concerning goat cryptosporidiosis are limited. *Cryptosporidium parvum, Cryptosporidium hominis* and the goat genotype are the only genotypes and species currently identified. Because human infections are mainly caused by *Cryptosporidium parvum* and *Cryptosporidium hominis*, both being goat species, goat crytposporidiosis has to be considered an important zoonosis.

Method and material

Animals

Investigations on the epidemiology of infection with *Cryptosporidium* spp, in goat kids aged one day through 6 weeks, were conducted during January 2007 - March 2008 on 412 goat kids from 12 goat farms in the central and northwest of Romania. They were divided into 4 age groups: I - goat kids under the age of one week, II – goat kids aged 1 to 2 weeks, III – goat kids aged 2 to 3 weeks, and IV – goat kids aged 3 to 6 weeks.

Conducted examinations

Fecal samples were collected and identified from the rectal level, from each individual. Until examination, the samples were kept cold (1-4 ° C), in the refrigerator, but no more than 48 hours. Coproparazitological processing of faecal samples was made by Ziehl-Neelsen staining method modified by Henricksen and the examination was performed on the optical microscope with immersion objective.

Micro- measurements

Micro- measurements were done on 40 oocysts with the help of the AdobePhotoshop CS 4 Program, on images obtained with the Olympus BSX430 microscope with immersion objective.

Statistical interpretation of data

For difference evaluation concerning the prevalence of infection with *Cryptosporidium* spp. between study samples, the Chi-square test was used (Epi Info 3.5.1).

Results and discussions

Of the 412 goat kids aged one days to 6 weeks, taken under survey, 99 goat kids eliminated *Cryptosporidium spp.* oocysts, which means 24% (95% IC = 20.0% - 28.5%).

Studies concerning cryptosporidiosis prevalence in goats, showed values between 0 and 42% (Majewski et al., 2000, Watanabe et al., 2005). In Sri Lanka, between 1020 goats belonging to 3 age groups, oocysts elimination was found in 291 (Noordeen et al., 2000). In Europe, in another study, conducted in Poland, the presence of cryptosporidiosis was observed in 10% of the goat kids in the study. In goat kids, the infection was more frequent and more intense than in adults (Majewski et al., 2000).

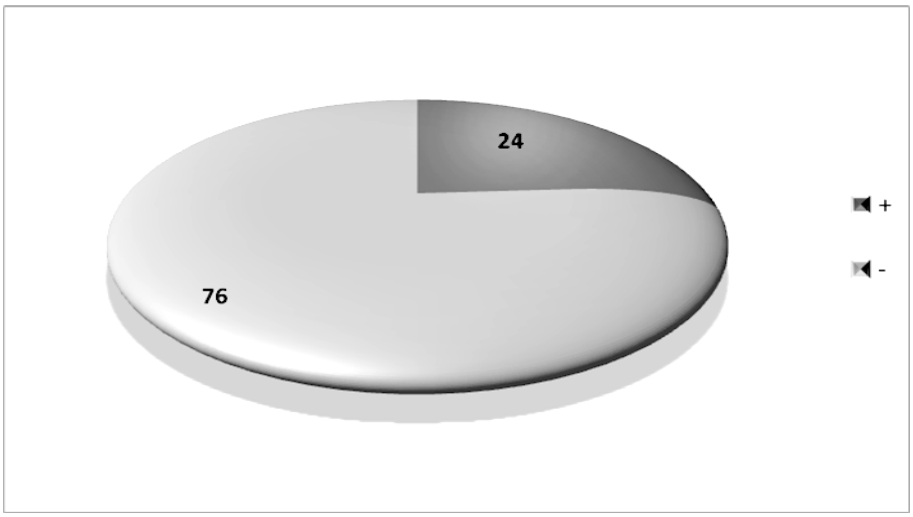


Fig. 1. The prevalence of cryptosporidiosis in kids in the central and northwestern Romania

Of the total goat kids examined, 349 showed no clinical symptoms, while 63 of them showed symptoms, expressed clinically by yellow diarrhea.

Of the 63 goat kids with diarrhea, 52 (82.5%) eliminated *Cryptosporidium spp*. oocysts, while 11 (17.5%) did not eliminate oocysts. For goat kids without diarrhea, things change radically; among the 349 goat kids taken into survey, only 47 (13.5%) eliminated *Cryptosporidium* spp. oocysts (Fig. 2). There were significant statistical differences concerning the elimination of oocysts in goat kids without clinical manifestations of diarrhea compared with goat kids with diarrhea ($p<0,000000001$).

It should be noted that only in 52.52% of cases, goat cryptosporidiosis was accompanied by symptoms, clinically expressed by diarrhea, while in the other cases the disease developed asymptomatic.

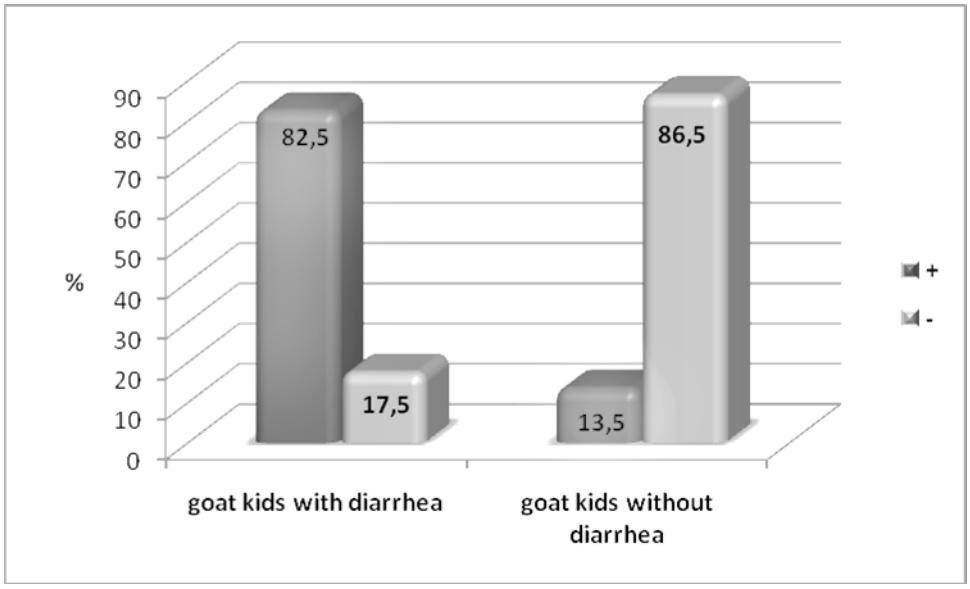


Fig. 2. Crytposporidiosis prevalence in goat kids based on clinical manifestations

Cryptosporidium spp. oocysts elimination was observed from the age of 4 days, with higher prevalence between 1 and 2 weeks (Table 1). The fact that infection with *Cryptosporidium spp*. was diagnosed so early, suggests a high contamination in this area.

In the age group under one week, out of the total of 91 goat kids taken in the survey, only 2 kids (2.2%) disposed of *Cryptosporidium spp*. oocysts.

The highest prevalence was observed between 1-2 weeks and 2-3 weeks, arround 39.4% and respectivelly 30.2%.

After the third week of life, the prevalence of cryptosporidiosis is reduced drastically, between the 55 goat kids taken into study in this age group, only one (1.8%) was eliminating *Cryptosporidium* spp. oocysts (fig. 3).

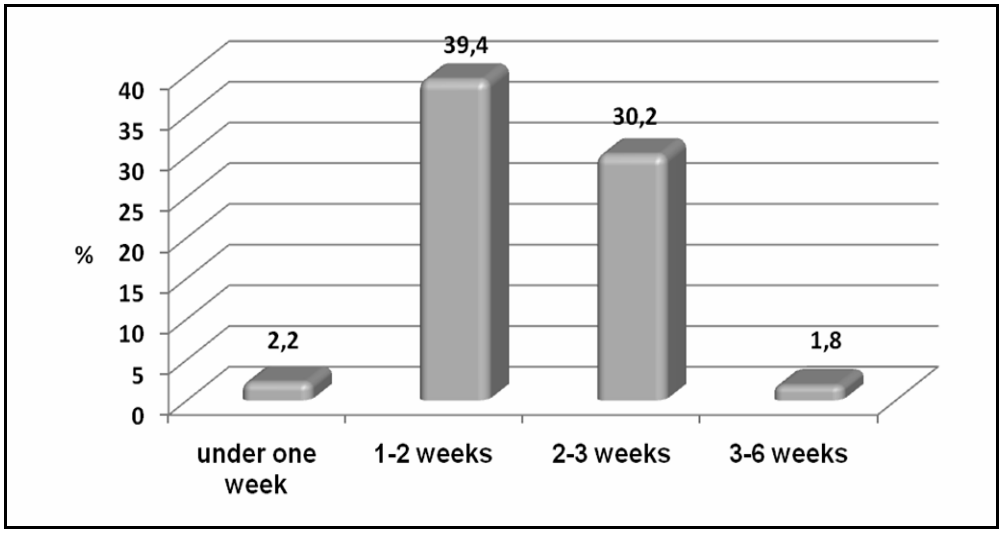


Fig. 3. Criptosporidiosis in goat kids according to age

After studying the correlations highlighted by the Henricksen stain, between oocysts elimination and the age of the goat kids, it was determined that there is no significant linear corelation.

Cryptosporidiosis in goats was detected at all ages, with the highest prevalence and intensity between the ages of 1-2 weeks (Misic et al., 2006; Bejan et al., 2007).

The distribution of cryptosporidiosis by gender is uniform. In the case of male goat kids, 215 were taken into study, and 51 were positive (23.7%); in the case of females, 48 were positive (24.4%) of the total 197 females taken into the study (Table 1). There were no statistically significant differences between the elimination of *Cryptosporidium spp.* oocysts in goat kids and sex ($p < 0.49$). Most researchers believe that there is

no correlation between the elimination of *Cryptosporidium* oocysts and the animals' sex (Noordeen et al., 2000; Delafosse et al., 2006).

Table 1. Criptosporidiosis distribution according to sex

	Males		Females		Total
	Frequency	Prevalence (%)	Frequency	Prevalence (%)	
Positive	51	23,7	48	24,4	99
Negative	164	76,3	149	75,6	313
Total	215	52,19	197	47,81	412

C*ryptosporidium* oocysts identified in the examination of fecal smears with the Henricksen stain, had an average size of 4,6±0,40/4,1±0,37µm.

Cryptosporidium species that develop in ruminants, according to Fayer and Xiao, (2007) are: *C. andersoni* (6,0-8,1 x 5,0-6,5), *C. bovis* (4,8-5,4 x 4,2-4,8µm), *C. hominis* (4,4-5,9 x 4,4-5,4µm) and *C. parvum* (≤4,5µm).

The data we obtained after micro measurements were done, along with the bibliographic data, made us conclude that, the goat kids studied were infected with a *Cryptosporidium* species with the average size of 4,36/4,10 µm, allowing us to consider that the species involved in our study was probably the *Cryptosporidium parvum*.

Given the fact that the goat kids with ages betweem 1 day and 6 weeks represent an important source for *Cryptosporidium parvum* (zoonotic species), any effort designed to control this infection in humans and animals must take into account this species and this age category.

Conclusions

The research concerning the epidemiology of cryptosporidiosis in goat kids aged one day to 6 weeks, in the center and northwest of Romania, resulted in the following conclusions:

The study demonstrates that *Cryptosporidium parvum* is one of the main pathological agents in neonatal diahreea in goat kids in the center and northwest of Romania.

The prevalence of cryptosporidiosis in goat kids with ages between one day and 6 weeks, from the center and northwest of Romania, is 24%.

Cryptosporidium spp. oocysts elimination was observed in 82.5% of the goat kids with diarrhea, and in 13.5% of the goat kids without diarrhea.

The highest prevalence of cryptosporidiosis in goat kids was observed in the age groups of 1-2 weeks (39.4%) and respectively 2-3 weeks (30.2%), *Cryptosporidium spp.* oocysts elimination being observed from around 4 days of age.

Cryptosporidiosis distribution based on sex was uniform.

The zoonotic risk of goat cryptosporidiosis can be determined only through molecular biology methods which identify exactly the species involved in the onset of infection.

REZUMAT

Au fost examinate 412 probe de fecale de la iezi cu vârsta cuprinsă între o zi şi 6 săptămâni, provenind din 12 ferme de caprine din centrul şi nord-vestul României. Probele au fost prelucrate prin colorația Ziehl-Neelsen modificată de Henricksen. Prevalența criptosporidiozei la iezii cu vârsta cuprinsă între o zi şi 6 săptămâni, a fost de 24% (99/412). Eliminări de oochisturi de *Cryptosporidium* spp. s-au observat la 82,5% din iezii cu diaree şi 13,5% din iezii fără diaree. Prevalența cea mai mare a criptosporidiozei, la iezi s-a constatat la categoriile de vârstă 1-2 săptămâni (39,4%) respectiv 2-3 săptămâni (30,2%) (p<0,00001). Eliminări de oochisturi de *Cryptosporidium spp.,* s-au înregistrat încă de la vârsta de 4 zile. Distribuția criptosporidiozei la iezi în funcție de sex, a fost uniformă (p<0,49). Acest studiu demonstrează că *Cryptosporidium parvum* este unul dintre agenții biotici implicați în declanşarea diareei neonatale la iezi în centrul şi nord-vestul României.

Cuvinte cheie: *Cryptosporidium*, ied, oochist, epidemiologie, diaree.

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