

# PREVALENCE OF CRYPTOSPORIDIAL INFECTION IN PIGLETS WITH CLINICAL SIGNS OF ENTEROPHATY\*\*

I. Pavlović<sup>1\*</sup>, M. Žutić<sup>1</sup>, V. Ivetić<sup>1</sup>, B. Savić<sup>1</sup>, O. Radanović<sup>1</sup>,  
B. Đukić<sup>1</sup>

<sup>1</sup> Scientific Veterinary Institute of Serbia, V.Toze 14, Belgrade, Serbia

\*Corresponding author: dr\_ivanp@yahoo.com

\*\*Original scientific paper

**Abstract:** In our examination cryptosporidial infections were detected in the 12,84% (69/537) of examined pigs. Organisms were found in the microvillus brush in the ileum, jejunum rarely in colon. The fact that 78% of those infected were 11-12 weeks old would suggest that there was a strong possibility of sub clinical infection in the weaned pig. All of cryptosporidia infected pigs had diarrhea but 32% of these had other primary diarrheagenic agents which also suggested that diarrhea in farm breeding pigs is a multifactor problem and cryptosporidia may act in concert with other agents to induce or exacerbate the clinical disease.

**Key words:** cryptosporidiosis, *Cryptosporidium* spp (parvum), pigs, enteropathies.

## Introduction

Cryptosporidiosis is a protozoan antropasoonosis caused by coccidian of the *Cryptosporidium* family. *Cryptosporidium parvum* has been reported worldwide and it is highly prevalent and contributes to both, morbidity and mortality of the domestic livestock and humans (Upton and Curent, 1985; Lindsay, 1992; Nagy, 1995; Pavlović et al., 1995 a). The oocyst stage, the finally stage in a series of intracellular development forms of the parasite, is the only stage that can survive extracellularly. Oocysts leave the infected host in the feces, which contaminate the environment. The usual routes of transmission are ingestion of contaminated water, food, and close physical contact with infected animals or humans (Moon and Benbrick, 1981; Tzipory et al. 1982; O'Donoghue, 1994; Fayer, 1994). Young humans and animals are most susceptible to infection, which is marked by diarrhea accompanied

by other manifestations of gastrointestinal infection.

The prevalence of cryptosporidial infection in pigs is little known. Most case of piglet cryptosporidiosis is asymptomatic and infection with this parasite does not appear to be major production problem (*Kennedy et al.*, 1977; *Lynks*, 1982; *Sanford*, 1987; *Pavlović et al.* 1995a, b). If clinical signs are present they consist of nonhaemorrhagic diarrhea (*Straw et al.*, 1999). Cryptosporidial infection is found at adult and young pigs, but usually at pigs from 6-12 weeks of age (*Sanford*, 1987.; *Villocarta et al.*, 1991; *Nagy*, 1995; *Pavlović et al.* 1996,b). As the presence of cryptosporidias has been established in adult pigs, but which do not contract this disease, this category of animals is the most responsible for its spreading and the infection of piglets which occurs in the fecal-oral manner (*Villocarta et al.* 1991.; *Nagy*, 1995; *Mišić et al.* 2003). The role of infection with cryptosporidia in the occurrence of the neonatal enteropathies in farm breeding piglets, because of the multiple agents, which cause this disease, has not been fully explained (*Sanford*, 1987).

In Serbia, cryptosporidial infection first time occurred by *Pavlović et al.*, 1995; 1996.,a) Infection with cryptosporidia can have an importance role in the etiology of this disease, either in itself or in combination with other causes of neonatal enteropathy in piglets (*Ivetić et al.*, 1996.; *Pavlović et al.* 1995.,b, *Pavlović et al.* 1997).

From these reason the aim of our work was to research the prevalence of cryptosporidial infection in piglets with clinical signs of enteropathy and asses its clinical importance in convention farm-raised pigs.

## Material and methods

During 2000-2006 a total of 537 pigs, 2-21 weeks old, were examined in the laboratory of Scientific Veterinary Institute of Serbia. All of the examined pigs were signs of diarrhea. After routine necropsy, parasitological, bacteriological and viral evaluations were performed, as required to establish the cause of disease in each pig (*Winn et al.* 1999). To parasitological examination we used faecal swab, gut contents and a mucous scrape of gut which we examined with Sheathers sugar flotation and in direct smears stained with Gimsa stain and Ziehl-Neelsen stain and examined by use of light microscopy in addition section of jejunum, ileum and spiral colon from each pig were fixed in natural buffered 10% formalin, embedded in paraffin, sectioned at 6 micrometer, stained with hematoxylin and eosin and examined by use of the light microscopy.

## Results and discussion

During our examination cryptosporidial organisms were detected in the microvillus brush border in the intestine of the 537 (12,34%) pigs examined. Small numbers of organisms were in 44 (63,76%), moderate number in 14 (20,28%) and large number in 11 pigs (15,94%). Infected pigs ranged from 7-12 weeks old but 63,76% (44 pigs) were 11-12 weeks old.

The examination of prevalence and age range of piglets infected with cryptosporidial organisms rarely been reported. Infection and diarrhea have been shown experimentally in pigs up to 10 days old and sub clinical infection in pigs inoculated at 15 days of age (*Tzipori et al.*, 1981., 1982.). In this retrospective study, infection was detected in pigs of various ages including young adults. The fact that 60% of those infected were 6-12 weeks old would suggest that there is a strong possibility of sub clinical infection in weaned pigs. Those confirmed examinations performed by *Villocarta et al.* (1991); *Nagy*, (1995); *Pavlović et al.* (1996.,b); *Mišić et al.* (2003). Cryptosporidia were seen much less frequently in pigs outside of this age range and were not found in pigs less than 1 week old. The results of our examination show that out of 63% infected pigs were 11-12 weeks old which suggested that infection apparently diminishes in pigs older than 12 weeks. Cryptosporidia were seen much less frequently in pigs outside this age range (7-11 weeks) and not found in pigs less than 7 weeks old (*Pavlović et al.* 1996 a). This is in contrast with findings in experimentally infected pigs, which were, however, nearly always inoculated as neonates (*Moon et al.*, 1981; *Tzipori et al.*, 1981;1982). It is possible that in the field, factors including maternally derived immunity may operate to reduce infection in neonates.

Infection apparently diminishes in pigs after 12 weeks old. Cryptosporidia were rarely seen in mature sow and boards only in low range of infection (*Villocarta et al.*, 1991; *Nagy*, 1995; *Pavlović et al.*, 1996 b, 1998, 2006; *Mišić et al.* 2003), which may explain the low prevalence of neonatal infection of piglets. If only few sows, perhaps gilts, were infected, they could have infected their offspring. Lateral spread of infection to other piglets may have occurred first in the farrowing room, and later in nursery and weaned rooms, accounting for the age pattern of infection seen in our study.

Parasites were located extracitoplasmatic, at parasitophorus vacuole, primarily in the brush border of the ileum and especially in the dome epithelium covering the Payer's patches. When only a few organisms were

detected they consistently could be found in dome epithelium. In the jejunum parasites always were located on the villous epithelium. In seven pigs cryptosporidia were found in the ileum, jejunum and colon (*Kennedy et al.*, 1977; *Pavlović et al.*, 2000). At histological intestine section, when lesion is present, they consist of mild to moderate villous atrophy, especially over ileal domes, and invasion of the lamina propria by large numbers of the mononuclear inflammatory cells and fewer eosinophilis (*Gardfiner et al.*, 1988).

Comparing our results of primary location of parasites with results of simillar examination (*Kennedy et al.*, 1977; *Lynks*, 1982) we concluded that the ileum and jejunum were the primary sites of colonization in pigs and that the colon is a minor site for attachment (*Pavlović et al.*, 2000).

During our examination, cryptosporidia was not determinate to be the only cause of diarrhea in examined pigs. With few exceptions, cryptosporidia were associated with sub clinical infection. Even in the 69 cryptosporidia infected pigs with diarrhea, other enteric pathogens or lesions, independently capable of causing diarrhea, were in all 32%. Other infectious or noninfectious agents (like colibacilosis, adenovirus infection, etc.) may have contributed to the diarrhea in this 32%. Experimental studies indicate a primary etiological role for cryptosporidia in the neonatal pigs (*Moon et al.*, 1981; *Tzipori et al.*, 1981; 1982), but diarrhea in farm breeding animals frequently is a multifactor problem especially in the young suckling pig (*Pavlović et al.*, 1995; 1997 b; 2006; *Ivetić et al.*, 1996). The role of infection with criptosporidia in the occurrence of neonatal enteropathies in piglets, because of the multiple agents, which cause this disease, has not been fully explained, but our examination indicated that cryptosporidia might act, either in itself or in concert with other agents to induce or exacerbate clinical disease.

## **KRIPTOSPORIDIJALNE INFEKCIJE KOD SVINJA SA KLINIČKIM ZNACIMA ENTEROPATIJE**

*I.Pavlović, M. Žutić, V. Ivetić, B. Savić, O. Radanović, B. Đukić*

### **Rezime**

U našem istraživanju, kriptosporidijalne infekcije su otkrivene u 12,84%

(69/537) ispitanih svinja. Organizmi su pronađeni u vaskularnim resicama prednjeg dela tankog creva, zadnjem delu tankog creva, a retko u debelom crevu. Činjenica da je 78% od inficiranih životinja bilo u uzrastu od 11-12 nedelja ukazuje da postoji velika mogućnost sub-kliničke infekcije kod odbijene prasadi. Sve svinje zaražene kriptosporidijom su imale proliv, ali 32% je imalo ostale primarne agense dijareje što ukazuje da je proliv kod farmskih svinja višestruki problem i da kriptosporidija deluje zajedno sa drugim agensima i izaziva pogoršanje kliničke bolesti.

**Ključne reči:** kriptosporidioza, *Cryptosporidium* spp (parvum), svinje, enteropatija

## References

- FAYER, R. (1994): Cryptosporidiosis-A worldwide Zoonoses, New strategy for prevention and treatment, International Conference of Parasites Zoonoses, Changchun, PR China, Abstracts 2-5.
- GARDFINER, C.H., FAYER, R., DUBEY, J.P. (1988): An Atlas of protozoan parasites in tissue. US Department of Agriculture, Agriculture Research Service, 1-83
- IVETIĆ, V., LONČAREVIĆ, A., VALTER, D., JERMOLENKO, G., ŽUTIĆ, M., PAVLOVIĆ, I. (1996): Evolucija patomorfoloških promena kod multikauzalnih enteropatija prasadi, 2. Simpozijuma uzgoj i zdravstvena zaštita svinja, Vršac, Zbornik kratkih sadržaja 1-4;
- IVETIĆ, V., ŽUTIĆ, M., VALTER, D., PAVLOVIĆ, I., SAVIĆ, B. (2000): Atlas patomorfoloških promena bolesti svinja. Naučni institut za veterinarstvo Srbije, Beograd, 1-148.
- KENNEDY, G.A., KREITNER, G.L., STRAFFUS, A.C. (1977): Cryptosporidiosis in three pigs. Journal of American Veterinary Medicine Association, 170, 348-350.
- LINDSAY, D.S., BLAGBURN, B.L., STUART, B.P. (1992): Cryptosporidiosis (*Cryptosporidium parvum*). pp 664-665, In: A.D.Leman: Diseases of Swine 7th edit., Wolf Publishing.
- LYNKS, I.J. (1982): Cryptosporidial infection of piglets. Australian Veterinary Journal, 58, 60-62.
- MIŠIĆ, Z., KATIĆ-RADIVOJEVIĆ, S., KULIŠIĆ, Z. (2003): *Cryptosporidium* infection in nursing, weaning and post-weaned piglets and sows in the belgrade district; Acta Veterinaria, 53, 361-366.
- NAGY, B. (1995): Epidemiological data on *Cryptosporidium parvum*

infection of mammals domestic animals in Hungary. *Magyar Allatvarjos Lapja* 50, 139-144.

O'DONEGHUE, P.J., ANDREWS, R.H., MORGAN, U.M. (1994): Genetic variations within *Cryptosporidia* sp. International Conference of Parasitic Zoonoses, Changchun, PR China, Abstract, 12-13.

PAVLOVIĆ, I., IVETIĆ, V., ROMANIĆ, S., ERSKI-BILJIĆ, M., LONČAREVIĆ, A., VALTER, D., NEŠIĆ, D., ŽUTIĆ, M. (1995 a): Prilog poznavanju kriptosporidioze svinja i njena uloga u nastajanju enteropatija prasadi. *Veterinarski glasnik*, 49, 729-732;

PAVLOVIĆ, I., ERSKI-BILJIĆ, M. (1995 b): Cryptosporidiosis in pigs and its role in enteropathy appearance in piglets. *Macedonia Veterinary Review* 24 (1-2), 51-53

PAVLOVIĆ, I., IVETIĆ, V., VALTER, D., NEŠIĆ, D., LONČAREVIĆ, A. (1996): Protozoarne infekcije prasadi u farmskim uslovima držanja. 2. Simpozijuma uzgoj i zdravstvena zaštita svinja, Vršac, Zbornik kratkih sadržaja, 4-6.

PAVLOVIĆ, I., IVETIĆ, V., LONČAREVIĆ, A., VALTER, D., NEŠIĆ, D. (1996 a): Prevalence of cryptosporidial infection in pigs. 1<sup>st</sup> international Conference on Emerging Zoonoses, Jerusalem, Israel, Programme and Abstracts, 89.

PAVLOVIĆ, I., IVETIĆ, V., ERSKI-BILJIĆ, M., MILUTINOVIĆ, M., KULIŠIĆ, Z. (1996 b): Cryptosporidial infection of pigs at the intensive breeding. *Journal of Protozoology Research* 6, 21-24.

PAVLOVIĆ, I., KULIŠIĆ, Z., VUJIĆ, B. (1997 a): Kriptosporidioza. pp 171-172, U: A. Lončarević Zdravstvena zaštita svinja u intenzivnom odgoju, Naučni institut za veterinarstvo Srbije, Beograd.

PAVLOVIĆ, I., IVETIĆ, V., VALTER, D., ROMANIĆ, S., HUDINA, V. (1997 b): Prevalence of cryptosporidial infection in pigs and its role in enteropathy appearance in piglets. Abstracts of VII Congress National de Medicine Veterinara Romania, Voinesa, Romania, 104

PAVLOVIĆ, I. (1998): Kriptosporidioza svinja. *Veterinarski informator* IV (12), 27

PAVLOVIĆ, I., IVETIĆ, V., VALTER, D., PETKOVIĆ, D., KOVAČEVIĆ, N. (2000): Cryptosporidial infection of pigs - spectrum of pathomorphological alteration. 18<sup>th</sup> Meeting of European Society of Veterinary Pathology, Toxicological Pathology and Experimental Pathology, Amsterdam, Netherlands, Programme and Abstracts, 191

PAVLOVIĆ, I., HUDINA, V., KULIŠIĆ, Z., IVETIĆ, V., ŽUTIĆ, M. (2006): Kokcidioza svinja u farmskom uzgoju. Zbornik naučnih radova

Instituta PKB Agroekonomik 12 (3-4), 127-133.

SANFORD, S.E. (1987): Enteric cryptosporidial infection in pigs: 184 cases (1981-1985). *Journal of American Veterinary Medicine Association* 190, 695-698.

STRAW, E.B., D'ALLAIRE, S., MENGELING, L.W., TAYLOR, J.D. (1999): *Diseases of swine*. 8th Iowa State University Press.

TZIPORY, S., MCCARTNEY, E., LAWSON, H.K. (1981): Experimental infection of piglets with cryptosporidia. *Research in Veterinary Science* 31, 358-368.

TZIPORY, S., SMITH, M., MAKIN, T. (1982): Enterocolitis piglets caused by *Cryptosporidia* sp. purified from calf faeces. *Veterinary Parasitology*, 11, 121-126.

UPTON, S.J., CURRENT, W.L. (1985): The species of *Cryptosporidia* (Apicomplexa / *Cryptosporidida*) infecting mammals. *Journal of Parasitology*, 71, 625-629.

VILLOCARTA, I., ARES-MAZAS, E., LORENZO, M.J. (1991): *Cryptosporidium parvum* in cattle, sheep and pigs in Galicia (N.W. Spain). *Veterinary Parasitology*, 38, 249-252.

WINN, W.JR., ALLEN, S., JANDA, W., KONEMAN, E. PROCOP, G., SCHRECKENBERGER, P., WOODS, G. (2006): *Koneman's Color atlas and textbook of diagnostic microbiology*, sixth ed. Lippincot Williams & Wilkin