Occurrence of the coccidium *Isospora suis* in piglets

K. Hamadejova, J. Vitovec

Department of Anatomy and Physiology of Farm Animals, Faculty of Agriculture, University of South Bohemia in Ceske Budejovice, Ceske Budejovice, Czech Republic

ABSTRACT: In the period October 2002–September 2004 we examined 2 996 samples of faeces of piglets at the age of 2–47 days. Samples were collected as so called "composite" ones from the pen floor. Samplings were done in 8 herds in Ceske Budejovice district. One herd was kept on the slatted floor, the other herds were housed on litter. Coprological examinations were carried out within 24 hours after sampling, and Sheather's sugar solution was used. Average prevalence of the coccidium *Isospora suis* was 24.8%. Isosporosis prevalence in piglets was highest on day 13 of piglet age (46.3%) and at week 2 after birth (38.8%). With respect to seasonal dynamics of isosporosis the frequency of findings was highest in autumn 2002 (29.0%) and lowest in summer 2003 (20.0%). In infected piglets the presence of *I. suis* was detected most frequently in connection with watery diarrhoeas (39.0%) and least frequently in piglets with shaped faeces (19.0%). From the aspect of infection intensity most infections (58.2%) were weak and fewest infections (2.9%) were severe. Isosporosis occurred on all examined farms.

Keywords: *Isospora suis*; isosporosis; prevalence; piglets

The coccidium *Isospora suis* is one of the most frequent causative agents in outbreaks of infectious diarrhoeas in sucking piglets with cosmopolitan occurrence (Johnson et al., 1992; Driesen et al., 1993; Chae et al., 1998; Niestrath et al., 2002).

The objective of the paper was to examine the present prevalence, seasonal dynamics and intensity of *I. suis* infections in piglets in conditions of this country, to evaluate the relationship of *I. suis* to the occurrence of diarrhoeas in piglets and to compare our results with results in Czech and foreign literature dealing with this problem.

MATERIAL AND METHODS

Samples of piglet faeces were taken in eight herds in Ceske Budejovice district from October 2002 to September 2004 (i.e. 8 periods – autumn 2002 to summer 2004). A litter housing system was used in seven herds and the animals of one herd were housed on plastic slats. A total of 2 996 samples was taken from piglets at the age of 2–7 days. Samples were collected as so called composite ones from the pen floor and put into plastic containers, from each litter of piglets separately. Faeces consistency and colour were examined macroscopically during sampling.

If faeces consistency was altered, each type of faeces was sampled into a separate container. A coprological examination was done within 24 hours after sampling; flotation method in Sheather's sugar solution (1 kg of beet sugar is dissolved in 640 ml of water and 13 g of phenol is added to eliminate mould presence) with specific volume weight 1.158 g/cm was used for this purpose.

Flotation is the most frequently used coprological method for parasitological examinations of faeces for parasitosis of protozoan and helminthic origin. It is based on the principle of flotation solutions that have higher specific weight than ordinary parasitic formations. During the processing of faeces

Supported by the Grant Agency of the Czech Republik (Grant No. 523/03/H076), the Development Fund of Universities (Grant FRVŠ 1149/04) and the Ministry of Education, Youth and Sports (Grant No. MSM 6007665806).

samples various stages of parasites are carried to the surface of the solution in a test-tube to float on the surface film.

Oocysts of parasites were examined under a light microscope at 200× magnification. Infection intensity was designated in the results as follows:

Sp = sporadic occurrence, very weak infection (1–2 oocysts in several fields of vision)
\+ = weak infection (1–2 oocysts in one field of vision)
++ = medium infection (up to 10 oocysts in one field of vision)
+++ = severe infection (more than 10 oocysts in one field of vision)

Evaluation of faeces consistency during sampling:

– = formed faeces
\+ = faeces of pasty consistency
++ = faeces of creamy consistency
+++ = watery faeces

RESULTS AND DISCUSSION

Coccidiosis caused with *Isospora suis* occurs worldwide in all countries with intensive pig husbandry (Mundt and Daugschies, 2004). Data on *Isospora suis* prevalence are usually based on coprological examinations of composite samples taken from the pen floor with piglet litters. The results document that isosporosis prevails in sucking piglets. In Australia Driesen et al. (1993) reported *I. suis* in 53.8% of samples, in Germany *I. suis* was found to occur in 26.9% of samples (Wieler et al., 2001) and in 42.5% of samples (Niestrah et al., 2002). Eysker et al. (1994) in the Netherlands detected *I. suis* in 36.3% of samples, in repeated samplings isosporosis prevalence among piglets amounted to 53.8%–62.2%. In Northern Europe Roepstorff et al. (1998) reported the value 17.2% as average prevalence of isosporosis. In this country Zajicek (1989) found out 30% average prevalence of *I. suis*. Svobodova and Lany (2003) proved the occurrence of *I. suis* in 14.7% out of 102 examined herds of pigs. They explained the low prevalence of *I. suis* by overall preventive application of anticoccidial drugs (toltrazuril). Baycox 5% Suspension is extremely efficient for treatment of coccidiosis (Holm and Volmer-Larsen, 2004; Mundt and Daugschies, 2004). Higher average prevalence *I. suis* (24.8%) in our material could be explained by absence in treatment of isosporosis.

Reports on the highest occurrence of *I. suis* in relation to piglet age vary. The highest prevalence of isosporosis was reported most frequently at the piglet age of two in some cases also third week of life (Mundt and Daugschies, 2004). In Canada and in Great Britain the occurrence of isosporosis was found to be highest in piglets at the age of 7–10 days (Robinson et al., 1983; Sanford, 1983). In Denmark Henriksen and Christensen (1989) also detected the highest prevalence at the second week of piglet age (36%). In this country Koudela et al. (1986) reported isosporosis in piglets at the age of 11–15 days (56.4%). In this study *I. suis* prevalence was found to be highest in the second week of piglet age (38.8%) (Figure 1) with the highest prevalence value on day 13 of piglet age (46.3%) (Figure 2).

Sayd and Kawazoe (1996) reported the highest prevalence of isosporosis in piglets in Brazil at the age of 10–19 days. In Germany Otten et al. (1996) and Niestrah et al. (2002) found out the high-

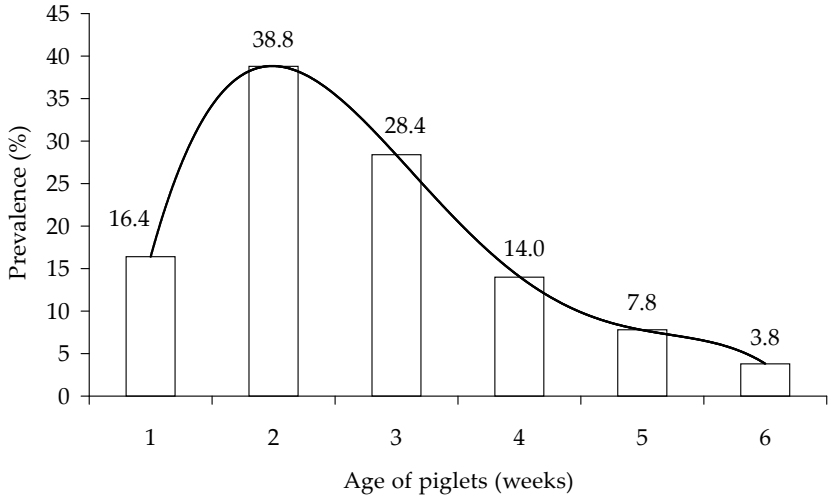

Figure 1. Prevalence of isosporosis in piglets

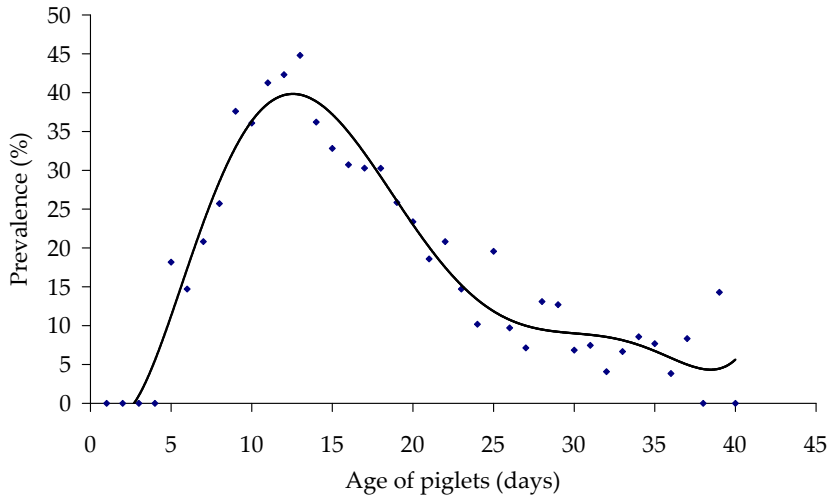

Figure 2. Prevalence of isosporosis in piglets (days)

est prevalence (41.3% and 48.2%, respectively) at week 3 of piglet life, and at week 4 of piglet life *I. uis* prevalence was still high (39.1% and 35.7%, resp.). In large herds with good management during the 2nd–4th week of piglet age Meyer et al. (1999) recorded an increase in *I. suis* prevalence from 18.6% through 32.6% to 37.7% at week 4 of piglet age.

Opinions concerning the influence of management on isosporosis occurrence in piglets are different. Sangster et al. (1976) reported higher frequency of isosporosis in herds with a litter housing system, with different level of animal tending. Otten et al. (1996) concluded that isosporosis might occur in any herd regardless of its size and management. We found out total isosporosis prevalence 24.8% mostly in a litter housing system; these results document that in our conditions there are not any significant differences in the prevalence and time of occurrence of *I. suis* between different housing systems and time periods compared to the results obtained in a litterless system of piglet housing that were reported by Koudela et al. (1986) in the eighties. The contaminated environment of pens (Lindsay and Blackburn, 1994) is a source of *I. suis* infection for piglets, and only few oocysts are enough for the infection spread (Christensen and Henriksen, 1994). We are convinced that herd zoohygiene is of primary importance for the spread of *I. suis* infection in piglets, regardless of the technique of piglet management.

Some authors found out the highest frequency of isosporosis in pig herds in summer months when the temperature in pens accelerates *I. suis* sporulation (Koudela et al., 1986; Stuart and Lindsay 1986; Chae et al., 1998). The results of other authors, and our observations (Figure 3), did not confirm seasonal dynamics of isosporosis in relation to the season (Driesen et al., 1993; Otten et al., 1996).

Many authors proved correlation between *I. suis* infection and diarrhoea of piglets (Otten et al., 1986; Meyer et al., 1999; Joachim and Daugschies, 2000) and correlation between the intensity of

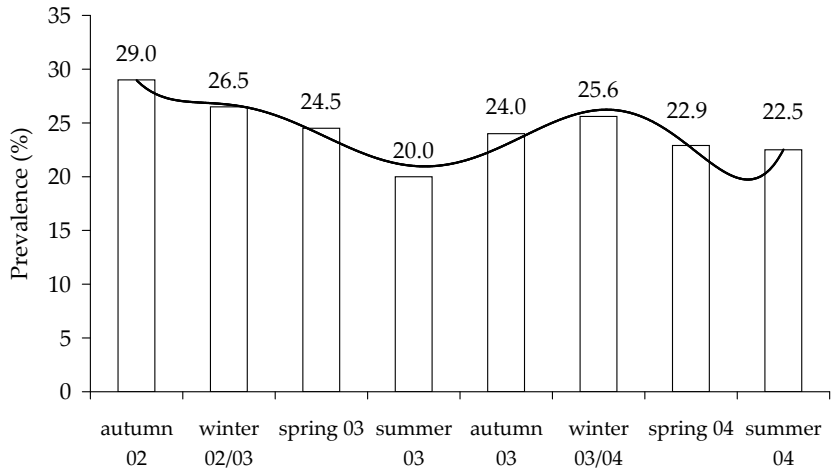

Figure 3. Influence the seasonal dynamics in prevalence of *Isospora suis*

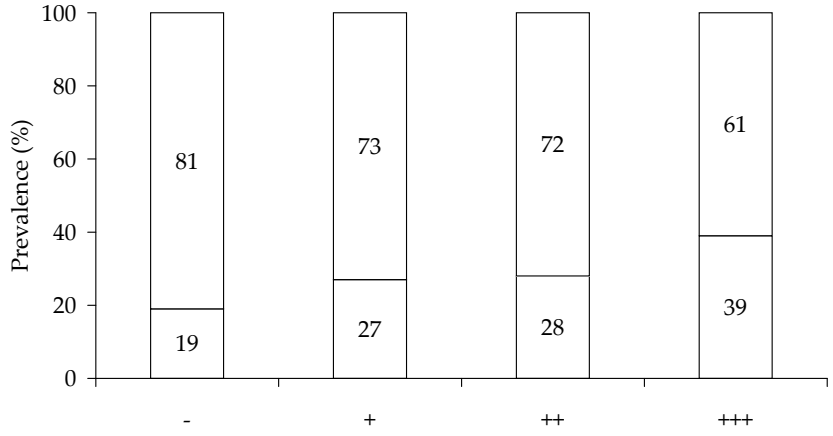

Figure 4. Affinity of isosporosis to fecal consistency

clinical symptoms and amount of shed oocysts (Koudela et al., 1986). In our study we found significant correlation between isosporosis and watery diarrhoeas. The highest isosporosis prevalence was demonstrated in piglets with watery diarrhoeas (39.0%) and the lowest in piglets with formed faeces (19.0%) (Figure 4). In piglet litters with watery diarrhoeas only very weak isosporous infections were usually found, hence it is to assume that other enteropathogenic agents of bacterial or viral aetiology contributed to the origin of diarrhoeas significantly. E.g. rotaviruses can increase *I. suis* and *Cryptosporidium* pathogenicity in parallel infections in piglets to a large extent (Vitovec et al., 1991; Enemark et al., 2003).

Acknowledgement

We thanks to Mrs. Helena Jiranova to translation.

REFERENCES

Chae C., Kwon D., Kim O., Min K., Cheon D., Choi C., Kim B., Suh J. (1998): Diarrhoea in nursing piglets associated with coccidiosis: prevalence, microscopic, lesions and coexisting microorganisms. Veterinary Record, 143, 417–420.

Christensen J.P.B., Henriksen S.V.A.A. (1994): Shedding of oocyst in piglets experimentally infected with *Isospora suis*. Acta Veterinaria Scandinavica, 35, 165–172.

Driesen S.J., Carland P.J., Fahy V.A. (1993): Studies on preweaning piglet diarrhoea. Australian Veterinary Journal, 70, 259–262.

Enemark H.L., Ahrens P., Bille-Hansen V., Heegaard P.M.H., Vigre H., Thamsborg S.M., Lind P. (2003): *Cryptosporidium parvum*: infectivity and pathogenicity of the "porcine" genotype. Parasitology, 126, 407–416.

Eysker M., Boerman G. A., Hollanders W., Verheijden J.H.M. (1994): The prevalence of *Isospora suis* and *Strongyloides ransomi* insuckling piglets in the Netherlands. Veterinary Quarterly, 16, 203–205.

Henriksen S.V.A.A., Christensen J.P.B. (1989): Coccidiosis in piglets in Denmark. Shedding of oocyst of *Isospora suis* in relation to age oh the host. Coccidia and intestinal ciccidiomorphs. In: 5th International Coccidiosis Conference, 17–20 October 1989, Tours, France. Ed. INRA Publ., 489–492.

Holm A., Volmer-Larsen K. (2004): Ten years of experience with the treatment of piglet coccidiosis in Denmark. In: Bayer HealthCare Animal Health at the 18th Congress of the International Veterinary Society, "The appropriate management of preweaning diarrhoea, a crucial point in maintaining pig health", June 2004, Hamburg, 15–18.

Joachim A., Daugschies A. (2000): Endoparaziten bei Schweinen in unterschiedlichen Nutzungsgruppen und Haltungsformen. Berlin Munchener Tierarztliche Wochenschrift, 113, 129–133.

Johnson M.V., Fitzgerald G.R., Welter M.W. (1992): The six most common pathogens responsible for diarrhea in newborn pigs. Veterinary Medicine, 87, 382–386.

Koudela B., Vitovec J., Sonkova J., Vobrova D. (1986): Kokcidióza sajících selat chovaných ve velkochovu. Veterinarni medicina, 31, 725–732.

Lindsay D.S., Blagburn B.L. (1994): Biology of Mammalian *Isospora*. Parasitology Today, 10, 214–220.

Meyer C., Joachim A., Daugschies A. (1999): Occurence of *Isospora suis* in larger piglet production units and on specialized piglet rearing farms. Veterinary Parasitology, 82, 277–284.

Mundt H.-C., Daugschies A. (2004): Current experience with *Isospora suis* infections. In: Bayer HealthCare Animal Health at the 18th Congress of the Interna-

tional Veterinary Society, "The appropriate management of preweaning diarrhoea, a crucial point in maintaining pig health", June 2004, Hamburg, 11–14.

Niestrath M., Takla M., Joachim A., Daugschies A. (2002): The role of *Isospora suis* as a pathogen in conventional piglet production in Germany. Journal of Veterinary Medicine B, 49, 176–180.

Otten O., Takla M., Daugschies A., Rommel M. (1996): Untersuchungen zur Epizootiologie und pathogen Bedeutung von Infektionen mit *Isospora suis* in Nordhein-Westfalen. Berlin Munchener Tierarztliche Wochenschrift, 109, 220–223.

Roepstorff A., Nilsson O., Oksanen A., Gjerde B., Richter S.H., Ortenberg E., Christensson D., Martinsson K.B., Barlett P.C., Nansen P., Eriksen L., Helle O., Nikander S., Larsen K. (1998): Intestinal parasites in swine in the Nordic countries: prevalence and geographical distribution. Veterinary Parasitology, 76, 305–319.

Robinson Y., Morin M., Higins R. (1983): Experimental transmission of intestinal coccidiosis to piglets: clinical, parasitological and pathological findings. Canadian Journal of Comparative Medicine, 47, 401–407.

Sanford S.E. (1983): Porcine neonatal coccidiosis: clinical, pathological, epidemiological and diagnostic features. California Veterinaria, 37, 26–30.

Sangster L.T., Seibod H.R., Mitchell F.E. (1976): Coccidial infection in suckling pigs. In: 19th Annual Meeting. Proceedings of the American Association of Veterinary Laboratory Diagnosticians, 51–55.

Sayd M.O., Kawazoe U. (1996): Prevalence of porcine neonatal isosporosis in Brazil. Veterinary Parasitology, 67, 169–174.

Svobodova L., Lany P.(2003): Záchyt patogenů intestinálního traktu u sajících selat. Veterinarstvi, 53, 181–184.

Vitovec J., Koudela B., Kudweis M., Stepanek J., Smid B., Dvorak R. (1991): Pathogenesis of experimental combined infections with *Isospora suis* and rotavirus in conventional and gnotobiotic piglets. Zentralblatt fur Veterinarmedizin, Reihe B, 38, 215–226.

Wieler L.H., Ilieff A., Herbst W., Bauer C., Vieler E., Bauerfeind R., Failing K., Klös H., Wengert D., Baljer G., Zahner H. (2001): Prevalence of enteropathogens in suckling and weaned piglets with diarrhoea in Southern Germany. Veterinary Medicine B, 48, 151–159.

Zajicek D. (1989): Průzkum výskytu kokcidiózy selat. Veterinarstvi, 39, 120–121.

Received: 04–12–04
Accepted after corrections: 05–04–08

Corresponding Author

Prof. MVDr. Jiri Vitovec, DrSc., Department of Anatomy and Physiology of Farm Animals, Faculty of Agriculture, University of South Bohemia in Ceske Budejovice, Studentská 13, 370 05 Ceske Budejovice, Czech Republic
Tel. +420 387 772 614, fax +420 387 772 621, e-mail: vitovec@zf.jcu.cz