PREVALENCE OF EIMERIA AND CRYPTOSPORIDIUM SP.
PROTOZOA IN POLISH COWS
AND IN COWS IMPORTED FROM THE NETHERLANDS
AS IN-CALF HEIFERS

BOGUMIŁA PILARCZYK, LIDIA KOŁODZIEJCZYK2, KATARZYNA ZAJĄCKOWSKA,
WANDA KUŹNA-GRYGIEL2, ALEKSANDRA BALICKA-RAMISZ,
AGNIESZKA TOMZA-MARCINIAK, AND RENATA PILARCZYK1

Department of Animal Hygiene and Prophylaxis, 1Department of Ruminant Science,
Faculty of Biotechnology and Animal Husbandry,
West Pomeranian University of Technology, 71-466 Szczecin, Poland
2Chair and Department of Biology and Medical Parasitology,
Faculty of Medicine, Biotechnology and Medical Laboratory,
Pomeranian Medical University, 70-111 Szczecin, Poland
bogumila.pilarczyk@biot.ar.szczecin.pl

Received for publication September 7, 2009

Abstract

The objective of the present study was to determine the prevalence of infection with Eimeria and Cryptosporidium sp. among Polish cows (n=60) and those imported as in-calf heifers from the Netherlands (n=75) to Poland. In addition, faecal samples of 12 farm workers were tested for Cryptosporidium sp. The prevalence of infection with Eimeria was evaluated based on coproscopic examination using the Willis and Schlaf flotation technique. The presence of Cryptosporidium sp. in faecal samples was tested using the modified Ziehl-Neelsen staining method, as well as an enzyme immunoassay. The coproscopic examination showed that 30.7% of the cows imported as in-calf heifers from the Netherlands to Poland were infected with Cryptosporidium sp. These animals also showed 30% higher, in comparison to Polish cows, the prevalence of infection with Eimeria bovis, which is regarded as one of the most pathogenic species. None of the Polish cows was infected with Cryptosporidium sp. Farm workers were found to be negative for Cryptosporidium coproantigen. The annual rate of infection with Eimeria in the cows imported as in-calf heifers from the Netherlands averaged 10.7% and was much lower than for Polish cows (18.3%). When importing cows from the Netherlands to Poland, attention must be given to Cryptosporidium sp.

Key words: cows, farm workers, Eimeria, Cryptosporidium, prevalence of infection.

Cryptosporidium sp. has been long known to veterinary medicine as a factor in gastrointestinal diseases. This protozoan is a member of the phylum Apicomplexa, which causes a disease known as cryptosporidiosis in humans and in many species of animals (4, 7). Young animals are particularly vulnerable to Cryptosporidium sp. infections (3, 11, 17, 23, 25). Common sources of the infection are adult animals that are asymptomatic parasite carriers, feed and water contaminated with oocysts, feed containers, pens, and personal clothes and tools contaminated with faeces (2). In the USA, several waterborne epidemics of cryptosporidiosis have been reported in humans (12). Cryptosporidioses is especially threatening to immunocompromised persons. Chronic consumptive diarrhoea due to Cryptosporidium sp. infection is a direct cause of death in 5%-15% of AIDS patients (19). A high prevalence of cryptosporidiosis was also reported in bowel cancer patients (29). There is no completely effective treatment for cryptosporidiosis. The rate of cryptosporidiosis is reduced by drugs such as Halocur (16) and Paromomycin (31), and by coccidiostats Decoquinate and Lasalocid (18).

Coccidiosis is a chronic parasitic disease of various animal species. Infections are caused primarily by Eimeria sp. protozoa, which live mainly in the epithelium of the small intestine. The most pathogenic species include E. bovis and E. zurni, while E. alabamensis, E. ellipsoidalis, and E. auburnensis are considered less pathogenic (22, 30). To date, 19 Eimeria species that parasitise cattle have been reported around the world. Twelve coccidia species are found in Europe: E. alabamensis, E. auburnensis, E. bovis, E. brasilensis, E. bukidnonensis, E. canadensis, E. cylindrica, E. ellipsoidalis, E. pellita, E. subspherica, E. wyomingensis, and E. zurni (9). Calves may become
infected by older animals that are asymptomatic coccidia carriers and oocyst shedders. The main sites of infections are pastures, poorly-kept cowsheds and outdoor areas, and standing water holes. In addition, nursing dams (direct suckling) that live in poor hygienic conditions (faecal contamination of the udder area) may infect young suckling animals.

The course of Cryptosporidium sp. and Eimeria infections in cattle is influenced by environmental conditions such as animal-house hygiene, personal hygiene, animal husbandry systems, microclimate, and functional and technological solutions. Research on the rate of infection with Cryptosporidium sp. and Eimeria protozoa is of great practical importance as it enables the effect of environmental conditions on the course of the infection to be determined. Understanding the sources of infection makes it possible to develop a prevention programme for cattle. In Poland, it is not obligatory to test imported cattle for Cryptosporidium sp. and Eimeria protozoa.

The objective of the present study was to determine the prevalence of infection with Eimeria and Cryptosporidium sp. among Polish cows and those imported as in-calf heifers from the Netherlands at a farm on which a new outbreak of cryptosporidiosis was discovered.

Material and Methods

The study involved 75 Holstein-Friesian cows imported as in-calf heifers from different farms of the Netherlands (Overijssel province) and 60 Polish cows. These animals were kept in the same farm (Zachodniopomorskie province) in the confinement system in loose barns on deep litter. Animals on this farm were fed on a TMR system and received no pasture. Water was available from non-freezing ball-valve drinkers. During a two-week quarantine, imported in-calf heifers were housed in a cowshed in Maszków, received flaked triticale, maize silage, oat haylage and hay, and had access to a salt block.

Out of 283 animals imported from the Netherlands, only those cows (n=75) whose calves had acute diarrhoea (watery faeces with greenish-yellow blood) were studied. Earlier examination of these calves between 4 and 27 d of age showed that 73.33% of the calves were infected with Cryptosporidium sp. (23).

In addition, 12 farm workers were examined. Faecal samples of the workers were tested only for Cryptosporidium sp. using a commercial enzyme immunoassay (ProSpecT® Cryptosporidium Microplate Assay, Alexon Trend).

The infection with Eimeria sp. was evaluated based on coproscopic examination using the Willis and Schlaf flotation technique (33). The species composition of coccidia was determined according to the key of Pellerdy (21). Oocysts were cultured additionally in a moist chamber at 24-26°C. A 2.5% water solution of potassium dichromate (K$_2$Cr$_2$O$_7$) was used as an anti-moulding agent.

The presence of Cryptosporidium sp. in cows’ faecal samples was tested using the modified Ziehl-Neelsen staining method (1).

All the examinations were performed in 2001, about six months after the animals were brought from the Netherlands.

Results and Discussion

The coproscopic examination showed that 30.7% of the cows imported as in-calf heifers from the Netherlands to Poland were infected with Cryptosporidium sp., and no incidence of this protozoan was detected in Polish cows. In-calf heifers imported to the same farm from the Netherlands showed that the level of infection averaged 11.37% (23). A study conducted in 2000 by Pilarczyk et al. (26) on the same farm revealed no Cryptosporidium sp. oocysts in Polish cows or in calves and cows originating from farms located in Western Pomerania. A study performed in different Wielkopolska areas in 1988 showed that 38.7% (14) and 56.25% (15) of calves were infected with Cryptosporidium sp. A study (17) conducted in the same region ten years later revealed Cryptosporidium sp. oocysts in 34.4% of cattle (39.7% in calves and 6.6% in cows). A Czech study revealed Cryptosporidium muris infection in 4.5% of heifers imported to the Czech Republic from France and in 7.9% of heifers imported from Germany (20). Cryptosporidium sp. prevalence rates in cattle were 11.9% in the USA (10), 20% in Canada (19), 13% in Sweden (13), and 19.7% in Spain (28).

Due to the risk of transmission of this parasite from infected animals to humans (7), 12 animal attendants working in this farm were subjected to immunoassay for Cryptosporidium coproantigen. However, the assay gave negative results.

The annual rate of infection with Eimeria protozoa in the cows imported as in-calf heifers from the Netherlands averaged 10.7% and was much lower than for Polish cows (18.3%) (Fig. 1).

In the coproscopic examination, the animals were found to have mixed invasion of coccidia. Five coccidia species were isolated from faecal samples of animals imported from the Netherlands: E. bovis, E. auburnensis, E. ellipsoidalis, E. subspherica, and E. zurnii. E. bovis was the dominant species. Four species were detected in Polish cows: E. bovis, E. auburnensis, E. ellipsoidalis, and E. zurnii (Fig. 2), with E. bovis and E. auburnensis being the most frequent.

Similar findings were obtained by Ciccek et al. (5), who also found that E. bovis and E. auburnensis were the most prevalent species in cows from different regions in Turkey, although the prevalence of infection with these species (31.25% and 25%, respectively) was much higher than that reported in the present study. Pavlisac (20) reported that E. bovis, E. auburnensis, and E. zurnii were also the species most frequently observed in pregnant cows imported to the Czech Republic from the Netherlands, Germany, France, and Denmark.
In heifers imported from the Netherlands to Poland, Pilarczyk et al. (24) reported six species of *Eimeria* protozoa, including *E. brasilienensis* in one heifer. Species composition of coccidia depended mainly on local environmental and breeding conditions (8).

In a study by Pilarczyk et al. (27) of cows from Western Pomerania, six coccidia species were isolated: *E. bovis*, *E. auburnensis*, *E. zürni*, *E. elipsoidalis*, *E. subspherica*, and *E. cylindrica*. Another study of cows from Western Pomerania, Pilarczyk et al. (26) reported that the prevalence of coccidia invasion ranged from 5.5% to 12.0% in a small farm and was 23.4% in a large-herd farm. In Dutch dairy farms, *Eimeria* protozoa were reported in 16% of cows and in 46% of calves (6). It is worth noting that *E. zürni*, one of the two most pathogenic coccidia species, was over 3 times more frequent in cows imported from the Netherlands (5.3%) than in Polish cows (1.7%). The results obtained are comparable with those of Cornelissen et al. (5), who reported the mean prevalence of infection with *E. zürni* in Dutch cows to be 4%.

When importing cows from the Netherlands to Poland, attention must be given to *Cryptosporidium* sp. The present study showed that over 30% of in-calf heifers imported to Poland were infected with this protozoan. These animals also showed, in comparison to Polish cows, 30% higher prevalence of infection with *Eimeria bovis*, which is regarded as one of the most pathogenic species.

**References**