Cryptosporidiosis in Newborn Calves: Prevalence and Control Strategies in Dairy Herds of Mashhad, Iran

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Abstract

Background: *Cryptosporidium parvum* is a protozoan parasite causing severe diarrhea in neonatal calves, impacting dairy farm productivity. This study investigates the prevalence and management of this infection in dairy herds in Mashhad, Khorasan Razavi, Iran.
Methods: From October 2023 to July 2025, fecal samples were collected from 70 diarrheic Holstein-Friesian calves (aged 5–21 days) across seven dairy farms in Mashhad. Calves were housed individually post-colostrum feeding. Samples, obtained rectally, were analyzed using modified Ziehl-Neelsen staining to detect *Cryptosporidium* oocysts under microscopy (×400–×1,000 magnification).
Results: *Cryptosporidium spp*. were detected in 56 of 70 (80%) diarrheic calves, confirming its role as a major pathogen. Clinical signs included watery diarrhea, dehydration, lethargy, weight loss, and abdominal pain. All farms reported oocyst shedding, with higher prevalence in moist, crowded conditions. Environmental persistence of oocysts and inadequate sanitation were key risk factors. Control measures, including 3% hydrogen peroxide disinfection and isolation of sick calves, were effective in reducing transmission. No curative treatments exist, but supportive fluid therapy improved outcomes.
Conclusion: *Cryptosporidium* is a significant cause of neonatal calf diarrhea in Mashhad, with an 80% prevalence. Robust sanitation, isolation, and water management are critical for control. The zoonotic potential underscores the need for worker protection. Further research on seasonal trends and prophylactic treatments is warranted to enhance dairy herd health in Iran.

Keywords: *Cryptosporidium*, Neonatal calves, Diarrhea, Dairy farms.

Introduction:

Cryptosporidium parvum is a protozoan parasite causing significant morbidity in neonatal calves, particularly in dairy systems, due to its high infectivity and environmental resilience (1). It is a leading cause of diarrhea in calves aged 5–21 days, leading to dehydration, malabsorption, and reduced growth (2). The parasite spreads via the fecal-oral route through ingestion of oocysts in contaminated feces, water, or feed (3). Oocysts are shed in high numbers

(up to 10^7 per gram of feces) and remain viable for months in cool, moist environments (4). Their resistance to common disinfectants complicates control (5). In Mashhad, Khorasan Razavi, Iran, dairy farms face challenges from *Cryptosporidium* due to intensive management practices. This study hypothesizes that *Cryptosporidium* is a primary cause of neonatal calf diarrhea in Mashhad's dairy herds and aims to assess its prevalence and propose control strategies.

Materials and Methods:

Study Population: Seven dairy farms in Mashhad, Khorasan Razavi, Iran, were studied from October 2023 to July 2025. All farms raised Holstein-Friesian calves, separated from dams after colostrum feeding and housed in individual pens until weaning at 3 months.
Sampling Technique: Fecal samples were collected from 70 calves under 1 month of age with diarrhea, untreated with antibiotics. Samples were obtained rectally by manual stimulation, transported on ice to the parasitology laboratory at Ferdowsi University of Mashhad, and stored at 4°C until processing.
Parasitological Examination: Fecal smears were air-dried, fixed with methanol, and stained using modified Ziehl-Neelsen. Smears were examined at ×400–×1,000 magnification. *Cryptosporidium* oocysts appeared as bright red, round bodies (4–6 µm) with sporozoites against a pale green background (4). Samples were scored positive if oocysts with characteristic morphology were detected.

Results and Discussion:

Of 70 diarrheic calves, 56 (80%) tested positive for *Cryptosporidium spp*. Affected calves, aged 5–21 days, exhibited watery diarrhea (yellow or pale, occasionally with mucus or blood), dehydration, lethargy, weight loss, and abdominal pain. All seven farms reported oocyst shedding, indicating widespread infection. Environmental factors, such as moist bedding and crowded pens, correlated with higher prevalence.

The 80% prevalence confirms *Cryptosporidium* as a dominant cause of neonatal calf diarrhea in Mashhad, consistent with global trends (2). Epidemics are driven by oocyst resilience, surviving in cool, humid conditions prevalent in winter (1,6). Poor sanitation and contaminated water sources exacerbate transmission (6).
Oocysts resist chlorine and iodine but are inactivated by 3% hydrogen peroxide or boiling water ($72^{\circ C}$ for 3 minutes) (7). Pens should be cleaned with 3% hydrogen peroxide, rinsed after 10 minutes to prevent corrosion, and dried, as oocysts are susceptible to desiccation (5).
Isolating sick calves reduces transmission, as one tablespoon of diarrheic feces can infect multiple calves (8). Testing and filtering water sources mitigate oocyst contamination (6).

No curative treatments exist, but fluid therapy corrects dehydration (9). Halofuginone lactate (7 µg/kg daily for 7 days) reduces oocyst shedding (10).

The study did not assess seasonal variations or other diarrhea-causing pathogens (e.g., rotavirus, E. coli), which may co-infect calves. Molecular typing to confirm *C. parvum* was not performed.

The high prevalence underscores the need for rigorous biosecurity. The zoonotic potential of *C. parvum* necessitates protective measures for farm workers (11). Future research should explore seasonal trends and the prophylactic efficacy of halofuginone in Iran's dairy systems.

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