The PHILIPPINE JOURNAL OF

Veterinary Medicine

Volume 61 No. 1 January - June 2024

Published by the College of Veterinary Medicine
University of the Philippines Los Baños

The Philippine Journal of Veterinary Medicine

Volume 61 No. 1 January - June 2024

The Philippine Journal of Veterinary Medicine (ISSN 0031-7705 print; eISSN 2984-763X online) is a peer-reviewed international journal of basic, applied, and translational research in veterinary medicine and biomedical science. It is published semi-annually, for the periods January-June and July-December each year, by the College of Veterinary Medicine, University of the Philippines Los Baños. All articles are subjected to double-blind review.

All communications should be addressed to:

The Editor-in-Chief
Philippine Journal of Veterinary Medicine
College of Veterinary Medicine
University of the Philippines Los Baños
Laguna, Philippines 4031
Telefax No. +63-49-536-2727
Email: pjvm1964@gmail.com, pjvm.uplb@up.edu.ph

This journal is abstracted/indexed by: SCOPUS, Biological Abstracts, Focus on: Veterinary Science & Medicine, Web of Science Zoological Records, CAB Abstracts, Index Veterinarius, Veterinary Bulletin, Parasitology Database, Helminthological Abstracts, Protozoological Abstracts. Review of Medical and Veterinary Entomology, EBSCO, ASEAN Citation Index, Prescopus Russia, i-journal (www.ijournals.my), i-focus (www.ifocus.my), i-future (www.ifocus.my), Philippine E-Journals (https://ejournals.ph) and UPLB Journals Online (http://journals.uplb.edu.ph/index.php/PJVM).

Scan Me
PJVM latest articles

Scan Me
Guidelines for Authors

Scan Me
Manuscript Submission Forms

Scan Me
Reviewer Comments Submission Forms

Table of Contents

Case Report

Toxocara vitulorum-eimeria spp. Mixed Infections and Treatment in a 44-day-old Anatolian Black Calf

Alper Ertürk[1,], Merve İder[2], Onur Ceylan[3], and Murat Kaan Durgut[2]*

[1] Department of Internal Medicine, Faculty of Veterinary Medicine, Mustafa Kemal University, Hatay, 31060, Turkiye
[2] Department of Internal Medicine, Faculty of Veterinary Medicine, Selcuk University, Konya, 42003, Turkiye
[3] Department of Parasitology, Faculty of Veterinary Medicine, Selcuk University, Konya, 42003, Turkiye

* Correspondence: alper.erturk@mku.edu.tr (Alper *Ertürk*)

Submitted: 12 Dec 2023 Revised: 7 Feb 2024 Accepted: 9 Feb 2024 Published: 15 Feb 2024

Abstract

Background: Toxocariasis and coccidiosis are common parasitic diseases affecting both farm animals and various species. While clinicians frequently diagnose these diseases in calves, mixed infections of toxocariasis and coccidiosis are exceptionally rare. **Methods:** A 44-day-old Anatolian black breed calf, presenting with tonic-clonic convulsions and abdominal pain, underwent laboratory and ultrasonographic examinations. **Results:** The laboratory findings indicated leukocytosis and hyperlactatemia in the calf. Ultrasonographic examination demonstrated intestinal dilatation and decreased motility. Stool analysis confirmed the presence of both toxocariasis and coccidiosis. Treatment with albendazole and toltrazuril led to the calf's recovery without complications. **Conclusions:** This case report represents the first documented instance detailing laboratory and ultrasound findings, as well as the treatment outcomes, of a calf concurrently afflicted with toxocariasis and coccidiosis. The successful treatment with albendazole and toltrazuril suggests potential therapeutic efficacy against mixed infections of these parasitic diseases.

Keywords

albendazole, calf, coccidiosis, toltrazuril, toxocariasis, ultrasonography

1. Introduction

Calf ascariosis caused by *Toxocara vitulorum* is recognized as an important limiting factor for livestock farms due to high morbidity, mortality and potential losses in meat and milk production [1]. *Toxocara vitulorum* can cause diarrhea, severe anemia, intestinal and biliary obstruction, and even death in 1–3-month-old calves [2-5]. Transmission occurs by oral ingestion of parasite eggs, the main routes of transmission in young animals are prenatal/placental and transmammary/ transcolostral [2]. In pregnant cows, inhibited larvae in somatic tissues migrate to the udder near parturition and may be shed in milk for 3-4 weeks postpartum [6]. The larvae become adults within 3 to 4 weeks and are then shed in the feces [7].

Coccidiosis is an important cause of diarrhea in calves and is caused by the protozoan *Eimeria* spp. [8-9]. Calves with immunosuppression and malnutrition are more susceptible to the disease [10]. Anorexia, bloody diarrhea, tenesmus, malaise are common clinical findings in calves with coccidiosis and death may occur in some cases [9].

Clinicians rarely detect mixed infections of toxocariasis and coccidiosis, which is supported by the fact that there is only one case report of mixed infection up to 2023, when the case report was written [11]. Previous reports on *T. vitulorum* infection in calves [12-13] have focused on the prevalence and management of infection. In contrast, this case report emphasizes the laboratory findings, ultrasound examination, and successful medical management of a calf that was infected with *T. vitulorum* and *Eimeria spp*.

2. Case Presentation

2.1 History

The case involved a 44-day-old male Anatolian black calf, which was brought to the Internal Medicine Department, Faculty of Veterinary Medicine, Selcuk University, with the chief complaint of anorexia and colic. Upon history taking, it was reported that contraction movements were observed such as repetitive raising of a rear leg or kicking at the abdomen, lying down and fluttering persisting for the last 5 days. The calf was fed with both milk and calf starter. Clinical examination revealed a rectal temperature of 38.6° C, a respiration rate of 30 breaths per minute, a pulse rate of 105 beats per minute, and mild dehydration (6%). No abnormalities were noted on thoracic and cardiac auscultation. Abdominal dilatation was detected on the right and left sides. Additionally, during the examination, the calf was observed suddenly falling to the ground, losing consciousness, and experiencing muscle jerks or spasms (tonic-clonic convulsions).

2.2 Laboratory Findings

Blood was drawn from the jugular vein for hematological and blood gas analysis. The analysis revealed no remarkable findings except for mild hyperlactatemia (Table 2) and leukocytosis (Table 1) characterized by neutrophilia.

Table 1. Hemogram analyses of calf with toxocariasis-coccidiosis mix infection.

Parameters	Result	Reference Range
WBC (m/mm^3)	22.08	(4-12)
LYM (m/mm^3)	7.61	(1.8-9.6)
MON (m/mm^3)	0.77	(0.0-0.6)
GRA (m/mm^3)	13.70	(0.4-3.6)
RBC (m/mm^3)	14.21	(6-11)
MCV (fl)	40.3	(40-60)
HCT (%)	57.2	(25-50)
MCH (pg)	11.4	(11-17)
MCHC (g/dl)	28.3	(30-40)
RDW	15	(8-12)
Hb (g/dl)	16.2	(8-15)
THR (m/mm^3)	236	(100-800)
MPV (fl)	11	(3-8)
PDW	10.8 (6-10)	(6-10)

WBC, white blood cells; LYM, lymphocyte; MON, monocyte; GRA, granulocyte; RBC, red blood cells; MCV, mean corpuscular volume; HCT, hematocrit; MCH, mean corpuscular hemoglobin; MCHC, mean corpuscular hemoglobin concentration; RDW, red cell distribution width; Hb, hemoglobin; THR, thrombocyte; MPV, mean platelet volume; PDW, platelet distribution width.

Table 2. Blood gases analyses of calf with toxocariasis-coccidiosis mix infection.

Parameters	Value
pH	7.45
pCO_2 (mmHg)	34.3
pO_2 (mmHg)	36.8
sO_2 (%)	60.6
K^+ (mmol/L)	4.6
Na^+ (mmol/L)	135
iCa (mmol/L)	1.05
Cl^- (mmol/L)	96
Glucose (mg/dL)	125
Lactate (mmol/L)	3.3
BE (mmol/L)	0.5
HCO_3^- (mmol/L)	24.3

pCO_2, arterial partial pressure of carbon dioxide; pO_2, arterial partial pressure of oxygen; SO_2, oxygen saturation; K^+, potassium; Na^+, sodium; iCa, ionized calcicum; Cl^-, chlorine; BE, base deficit; HCO_3^- Bicarbonate.

The fecal samples were examined for parasitism by sedimentation and Fullerborn flotation methods. The eggs and oocysts were identified under the microscope at 10, 20 and 40x magnification (Leica DM1000). Parasitological examination revealed mixed infection with *T. vitulorum and Eimeria* spp. (Fig. 1). Using the modified McMaster technique, 40,850 *T. vitulorum* eggs and 11,500 *Eimeria spp.* oocysts were detected in gram feces.

2.3 Ultrasonographic Findings

Transcutaneous ultrasonography was performed with a 3.5 MHz sector transducer on the right side of the abdomen. Ultrasonography showed dilated intestinal lobes, partial hyperechoic thickening of the intestinal walls, accumulation of anechoic peritoneal fluid between the intestinal lobes, and decreased intestinal motility. A large number of adult *T. vitulorum* ascarids were seen in the ultrasonogram (Fig. 2) and subsequently found in the feces of the calf (Fig. 3).

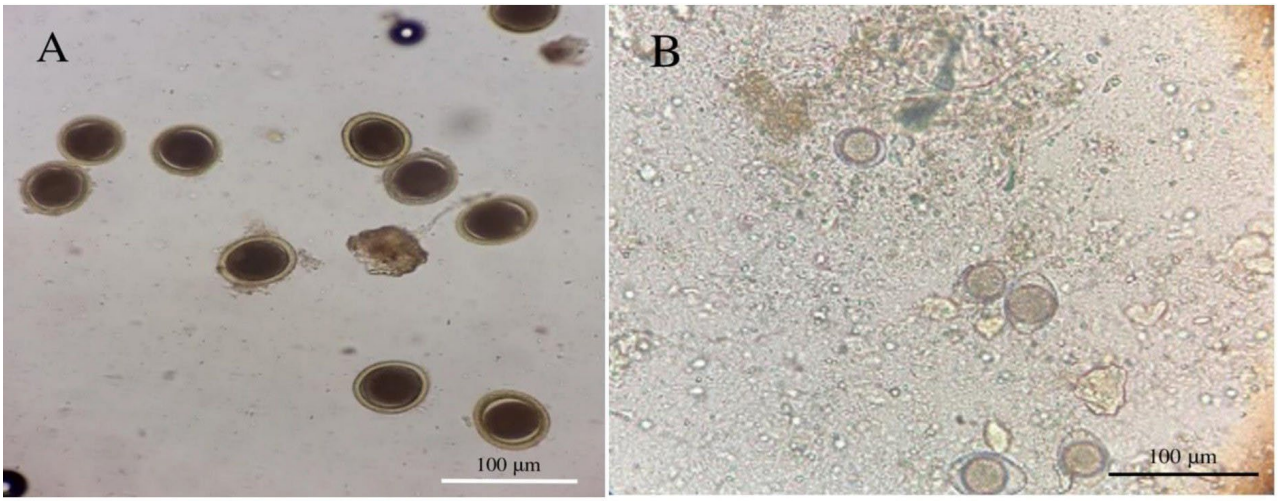

Fig. 1. Eggs of *T. vitulorum* and oocysts of *Eimeria spp.* in microscopic examination at 40x magnification (A) *T. vitulorum* eggs. (B) *Eimeria spp.* oocysts.

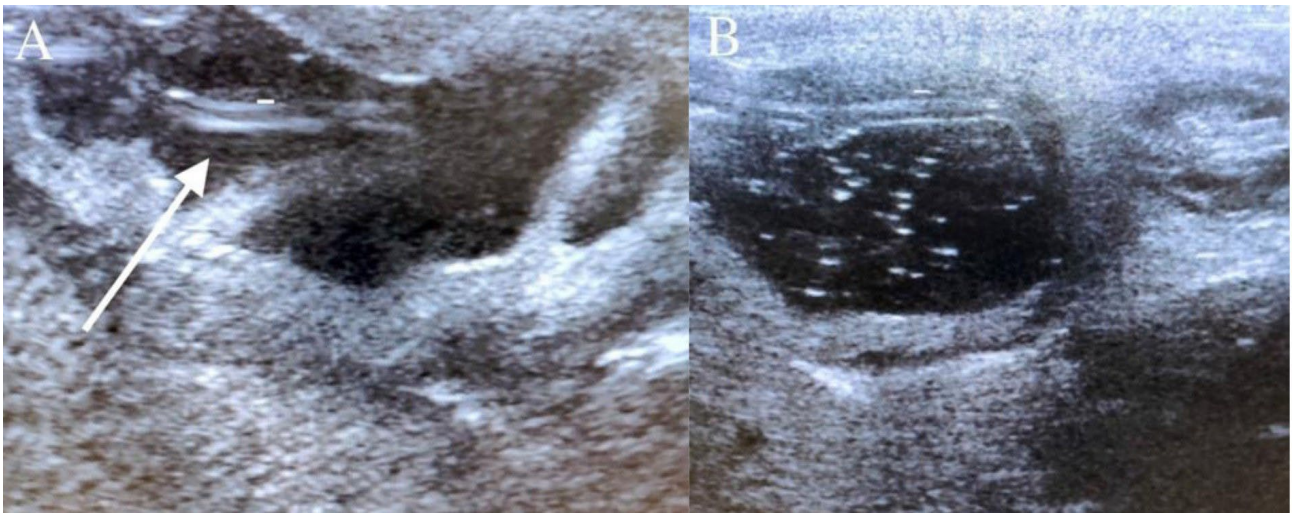

Fig. 2. Ultrasonogram of *T. vitulorum* parasites. (A) In longitudinal section, *T. vitulorum* parasites are seen as two hyperechoic lines resembling "train rails" (see arrow) and, hyperechoic cross-section view of *T. vitulorum* (B).

Fig. 3. Adult Toxocara worms in feces.

2.4 Treatment

As a result of the diagnosis, the calf received albendazole (Vetalben®, Vetas) at a dose of 15 mg/kg bodyweight (bw), orally, three times with two-day intervals [14]. Mepyramine maleate (Histavet®, Vetas) was administered intramuscularly at a dose of 1 mg/kg bw for three days, and paraffin liquid (Vaseline-Liquid®, Tekkim) was given orally at a dose of 1 ml/kg bw for three days. This was aimed to alleviate the parasite load in the intestines and prevent constipation caused by dead ascarids. For the treatment of coccidiosis, toltrazuril was administered once (Coc-cide®, Alke) at 15 mg/kg bw, orally [15]. Two weeks after treatment, fecal samples were collected for control. No parasite were detected and the calf recovered without any complications. Despite housing the calf in the same pen with 20 others, no clinical signs were observed in any of the other calves. Fecal samples from all other calves in the same barn were examined for parasitism. However, no parasitic agent was found in the feces of the other calves. After treatment was initiated, no additional cases were observed in the herd.

3. Discussion

This case report presented the hemogram, blood gas analysis, ultrasound examination findings and medical treatment administered to a calf infected with *T. vitulorum-Eimeria* spp. showing severe clinical signs. While only one case of calf infected with *T. vitulorum-Eimeria* spp. mixed infection has been reported in the literature [11], our case report offers detailed laboratory findings and ultrasound images of the disease, serving as a comprehensive guide for clinicians.

The severe pain, kicking of the abdomen and occasional lying down and fluttering observed in the presented case serve as an indicator of the infection's severity [12]. Despite severe clinical signs, the presented case did not exhibit ileus, a phenomenon reported in cases involving ascarids causing mechanical ileus in different animal species [4][5][12][16]. The absence of ileus may be attributed to the number of adults settling in the intestines [5].

Laboratory examination revealed no remarkable findings except leukocytosis characterized by neutrophilia and hyperlactatemia (Table 1, 2). The observed leukocytosis with neutrophilia is related to intestinal inflammation and is consistent with the literature [5]. The slight lactate increase observed in this case was associated with hypoperfusion due to mild dehydration [17].

Ultrasonography imaging of intestinal roundworms has been reported in humans [18] and veterinary medicine [19-21]. In longitudinal section view, each roundworm exhibits an unshaded "train track" appearance characterized by two parallel hyperechoic lines separated by a narrow inner hypoechoic zone [20]. In cross-section, the worm displays a small doughnut-like appearance with a circular hyperechoic non-shading wall and a hypoechoic center [22]. In this case, *T. vitulorum* parasites, resembling train tracks, are visible on long-axis imaging (Fig. 2). Cross-sectional images of the parasites are seen on short-axis imaging with dilatation of the intestines (Fig. 2). The identification of several relatively distended intestinal lobes during the ultrasound examination is indicative of ileus [23]. However, in this case, the diagnosis of ileus was excluded based on the observation of fecal output.

The most important hosts of *T. vitulorum* are buffaloes and cattle [24]. The larvae begin to migrate to the udder about eight days before the birth of pregnant cows and are excreted in milk for 3-4 weeks after birth. Larvae reach the adult stage in the duodenum of 10-12-day-old calves. Eggs can be found in feces approximately 22.8 ± 1.8 days after oral ingestion. Although fecal egg excretion is most observed in calves aged 5-7 weeks, this condition can persist until 2-4 months of age [24]. An adult female *T. vitulorum* produces egg ranging from 8000 to as high as 100,000 eggs per gram (g) of feces per day [7] [24]. In this case report, the detection of 40.850/g *T. vitulorum* eggs in the feces aligns with the literature [7][24-25]. Coccidiosis, considered a secondary infection, is believed to be associated with factors such as immunosuppression, a contaminated environment and malnutrition [26]. Animals displaying clinical signs and having oocyst levels greater than 5,000 are typically diagnosed with coccidiosis [27]. Consistent with the literature, the presented case also exhibited clinical coccidiosis.

Although adult ascarids in the intestine are generally sensitive to various anthelmintics, they exhibit the highest sensitivity to benzimidazoles and pyrantel [13][28]. We provided an effective treatment protocol using albendazole and toltrazuril.

As a result of fecal examinations, only one out of 20 calves were found to be infected and clinical findings were observed, which is consistent with the data in the literature [13] [29]. This can be attributed to the possibility that other calves had been previously infected and successfully expelled the parasite from their bodies [29]. At the time of investigation, all the calves were older than three months. Although routine parasitic treatment is reported to be ineffective for *T. vitulorum* in calves aged three months and older, given that high levels of egg shedding have likely already occurred [30]. Therefore, antiparasitic treatment for other calves in the herd is still recommended. In adult cattle, anthelmintic treatment is generally ineffective due to hypobiosed larvae [31]. Nevertheless, anthelmintic treatment is advised for pregnant cattle three weeks before parturition to mitigate prenatal infection [32]. We provided antiparasitic guidance to pregnant cows, and through meticulous follow-up, we confirmed that the issue did not recur on the farm.

In conclusion, the presented case report highlights the coexistence of *T. vitulorum* and *Eimeria* spp. The laboratory examination revealed leukocytosis and hyperlactatemia, while ultrasound examination showed dilated intestinal lobes with decreased motility. The findings suggest that an effective medical treatment can be achieved with a combination therapy involving albendazole and toltrazuril.

Availability of Data and Materials

In this case report, all data pertaining to the case are shared in the related tables.

Author Contributions

Conceptualization, A.E and M.I.; Methodology, A.E. and M.K.D.; Investigation, O.C.; Resources: E.A. and O.C.; Data curation, A.E. and O.C.; Writing-first manuscript draft, E.A.; Writing-review and editing, E.A and M.K.D.

Ethics Approval and Consent to Participate

Not applicable.

Acknowledgment

None.

Funding

None.

Conflict of Interest

The authors declare no conflict of interest.

References

[1] Chowdhury, N. (2002). Epidemiology of helminths of livestock in Indian subcontinent. Journal of Veterinary Parasitology, 16, 79-87. https://doi.org/10.1007/s12639-015-0682-0

[2] Wickramasinghe, S., Yatawara, L., Rajapakse, R. P., & Agatsuma, T. (2009). Toxocara vitulorum (Ascaridida: Nematoda): mitochondrial gene content, arrangement and composition compared with other Toxocara species. Molecular and Biochemical Parasitology, 166(1), 89-92. doi: https://doi.org/10.1016/j.molbiopara.2009.02.012

[3] Işık, N., & Ekici, Ö. D. (2017). Prevalence of Eimeria spp. in diarrhoeic calves. Eurasian Journal of Veterinary Sciences, 33(3), 158-162. http://dx.doi.org/10.15312/ EurasianJVetSci.2017.152

[4] Audu, Z., & Abalaka, S. E. (2019). Toxocara vitulorum intestinal impaction in male White Fulani calves: a case report from Nigeria. Journal of Parasitic Diseases, 43, 597-600. https://doi.org/10.1007/ s12639-019-01133-3

[5] Reddy, B. S., & Sivajothi, S. (2017). Paralytic ileus due to Toxocara vitulorum in a calf and its management. Comparative Clinical Pathology, 26, 1335-1338. https://doi.org/10.1007/s00580-017-2537-9

[6] Raut, S., Sahu, R. K., & Mahalik, A. (2016). Toxocara infestation in a suckling buffalo calf: A case report. Scholarly Journal of Agricultural Science, 3(2), 123-125.

[7] Kassai, T. (1999). Veterinary Helminthology. Butterworth-Heinemann, pp. 102-103.

[8] Dubey, J. P. (2018). Re-evaluation of endogenous development of Eimeria bareillyi Gill, Chhabra, and Lall, 1963 in water buffalo (Bubalus bubalis). Parasitology, 145(14), 1845-1852. https://doi.org/10.1017/s0031182018000604

[9] Bangoura, B., & Bardsley, K. D. (2020). Ruminant coccidiosis. Veterinary Clinics of North America: Food Animal Practice, 36(1), 187-203. https://doi.org/10.1016/j.cvfa.2019.12.006

[10] Eğlenti, N., Kozat, S., & Denizhan, V. (2020). Investigation of immunoglobulin (IgE, IgA, IgG, IgM) concentrations in calves naturally infected with coccidiosis. Journal of Istanbul Veterinary Science, 4(1), 1-7. https://doi.org/10.30704/http-www-jivs-net.691671

[11] Maurya, P. S., Sahu, S., Rawat, S., & Jaiswal, V. (2020). Simultaneous Infection in a Buffalo calf with Toxocara vitulorum and Eimeria bareillyi: A Case Report. Research Journal of Veterinary Practice, 8(1), 1-3. http://dx.doi.org/10.17582/ journal.rjvp/2020/8.1.1.3

[12] Van der Steen, L., Pardon, B., Sarre, C., Valgaeren, B., Van Hende, D., Vlaminck, L., & Deprez, P. (2014). Intestinal obstruction by Toxocara vitulorum in a calf. Vlaams Diergeneeskundig Tijdschrift, 83(6). https://doi.org/10.21825/ vdt.v83i6.16628

[13] Ahmed, R., Wani, Z. A., Allaie, I. M., Bushra, M. S., & Hussain, H. A. (2016). Toxocara vitulorum in a suckling calf: a case study. Journal of Parasitic Diseases, 40(4), 1330-1331. https://doi.org/10.1007/s12639-015-0682-0

[14] Borgsteede, F.H.M., Holzhauer, M., Herder, F.L., Veldhuis-Wolterbeek, E.G. & Hegeman, C. (2012). Toxocara

vitulorum in suckling calves in the Netherlands. Research in Veterinary Science, 92(2), 254-256. https://doi.org/10.1016/j. rvsc.2010.11.008

[15] Mundt, H.C., Bangoura, B., Mengel, H., Keidel, J. and Daugschies, A. (2005). Control of clinical coccidiosis of calves due to Eimeria bovis and Eimeria zuernii with toltrazuril under field conditions. Parasitology research, 97, 134-142. https://doi.org/10.1007/s00436-005-1457- 9

[16] Willard, M. (2009). Digestive system disorders. In: Small Animal Internal Medicine (4th ed.). Mosby Elsevier. pp. 351-483.

[17] Sen, I. & Constable, P.D. (2013). General overview to treatment of strong ion (metabolic) acidosis in neonatal calves with diarrhea. Eurasian Journal of Veterinary Sciences, 29(3), 114-120.

[18] Peck, R. J. (1990). Ultrasonography of intestinal ascaris. Journal of clinical ultrasound, 18(9), 741-743. https://doi.org/10.1002/jcu.1990.18.9.741

[19] Wigger, A., Peppler, C., & Kramer, M. (2007). Appearance of intestinal roundworms in a dog and a cat. The Veterinary Record, 161, 200-201. https://doi.org/10.1136/vr.161.6.200

[20] Nielsen, M.K., Donoghue, E.M., Stephens, M.L., Stowe, C.J., Donecker, J.M. and Fenger, C.K., 2016. An ultrasonographic scoring method for transabdominal monitoring of ascarid burdens in foals. Equine Veterinary Journal, 48(3), pp.380-386. https://doi.org/10.1111/evj.12478

[21] Corda, A., Tamponi, C., Meloni, R., Varcasia, A., Parpaglia, M. L. P., Gomez-Ochoa, P., & Scala, A. (2019). Ultrasonography for early diagnosis of Toxocara canis infection in puppies. Parasitology research, 118, 873-880. https://doi.org /10.1007/s00436- 019-06239-4

[22] Mahmood, T., Mansoor, N., Quraishy, S., Ilyas, M., & Hussain, S. (2001). Ultrasonographic appearance of Ascaris lumbricoides in the small bowel. Journal of ultrasound in medicine, 20(3), 269-274. https://doi.org/10.7863/jum.2001.20.3.269

[23] Braun, U. (2009). Ultrasonography of the gastrointestinal tract in cattle. Veterinary Clinics of North America: Food Animal Practice, 25(3), 567-590. https://doi.org/10.1016/j.cvfa.2009.07.004

[24] Roberts, J. A., Fernando, S. T., & Sivanathan, S. (1990). Toxocara vitulorum in the milk of buffalo (Bubalus bubalis) cows. Research in Veterinary Science, 49(3), 289-291. https://doi.org/10.1016/0034- 5288(90)90061-8

[25] Avcioglu, H., & Balkaya, I. (2011). Prevalence of Toxocara vitulorum in calves in Erzurum, Turkey. Kafkas Universitesi Veteriner Fakultesi Dergisi, 17(3). doi: https://doi.org/10.30607/ kvj.857107

[26] Durgut, M. K., & Ok, M. (2023). Evaluation of Some Intestinal Biomarkers in the Determination of Intestinal Damage in Calves with Coccidiosis. Tropical Animal Science Journal, 46(2), 221-230. https://doi.org/10.5398/tasj.2023.46.2.221

[27] Bangoura, B., Mundt, H. C., Schmäschke, R., Westphal, B., & Daugschies, A. (2012). Prevalence of Eimeria bovis and Eimeria zuernii in German cattle herds and factors influencing oocyst excretion. Parasitology Research, 110, 875-881. https://doi.org/10.1007/s00436-011-2569-z

[28] Davila, G., Irsik, M., & Greiner, E. C. (2010). Toxocara vitulorum in beef calves in North Central Florida. Veterinary Parasitology, 168(3-4), 261-263. https:// doi.org/10.1016/j.vetpar.2009.11.026

[29] Borgsteede, F. H., Holzhauer, M., Herder, F. L., Veldhuis-Wolterbeek, E. G., & Hegeman, C. (2012). Toxocara vitulorum in suckling calves in the Netherlands. Research in Veterinary Science, 92(2), 254-256. https://doi.org/10.1 016/j. rvsc.2010.11.008

[30] Goossens, E., Dorny, P., Vervaecke, H., Roden, C., Vercammen, F., & Vercruysse, J. (2007). Toxocara vitulorum in American bison (Bison bison) calves. Veterinary Record, 160(16), 556. https:// doi. org/10.1136/vr.160.16.556

[31] Roberts, J. A. (1993). Toxocara vitulorum in ruminants. Helminthological Abstracts, 62(4), 151-174. https://doi.org/10.1079/ cabicompendium.61375

[32] Saudah, S., Norhamizah, A. H., & Za, F. (2012). Identification of Toxocara vitulorum eggs in a calf. Malaysian Journal of Veterinary Research, 3(2), 71- 74.