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Lungworm infection in a central Iowa beef herd

Joe Smith
Iowa State University, jss303@iastate.edu

Jeff Olivarez
Iowa State University, olivarez@iastate.edu

Matt T. Brewer
Iowa State University, brewermt@iastate.edu

Mitch R. Hiscocks
Iowa State University, mhscx@iastate.edu

Claire B. Andreasen
Iowa State University, candreas@iastate.edu

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Abstract

A beef herd presented four calves, aged 8–9 months, in late September for evaluation of respiratory disease of 2 months duration that was non-responsive to antimicrobial treatment. Calves were housed on a marshy pasture and similar signs occurred in calves during the same months the previous 2 years. The owner reported greater than 50% of calves were affected with a significantly decreased rate of gain. Physical examination revealed tachypnea and cough. Transtracheal wash cytology, viral respiratory PCR panel and bacterial culture were performed. The viral respiratory PCR panel was negative, and bacterial cultures identified commensal bacteria.

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TITLE OF CASE ***Do not include the words "Case report"***

Lungworm infection in a central Iowa beef herd.
Joe S Smith, Jeff D Olivarez, Matt T Brewer, Mitch R Hiscocks, Claire B Andreasen

DESCRIPTION ***Up to 250 words summarising the importance of the image(s)***

A beef herd presented four calves, aged 8-9 months, in late September for evaluation of respiratory disease of two months duration that was non-responsive to antimicrobial treatment. Calves were housed on a marshy pasture and similar signs occurred in calves during the same months the previous two years. The owner reported greater than 50% of calves were affected with a significantly decreased rate of gain. Physical examination revealed tachypnea, and cough. Transtracheal wash cytology, viral respiratory PCR panel, and bacterial culture were performed. The viral respiratory PCR panel was negative, and bacterial cultures identified commensal bacteria.

Direct and cytospin cytology from a transtracheal wash contained increased cellularity and mucus with erythrocytes. There were ciliated epithelial cells and a mixture of inflammatory cells, including macrophages (51%), neutrophils (32%), lymphocytes (11%), and lesser numbers of eosinophils (6%) and occasional mast cells <1%. Some macrophages contained hemosiderin, indicating prior hemorrhage. The cytopspin preparation revealed a larvated nematode egg, 54 µm wide and 84 µm long (Figure 1, Alternate Figure 1). The larva contained food granules, consistent with the L1 stage of *Dictyocaulus viviparous*. Cytology of the transtracheal wash is displayed in Figure 2.

The referring veterinarian performed fecal sedimentation of 5 calves that were herdmates and identified lungworm appearing eggs on 4/5 samples. Following the test results, the client administered injectable ivermectin and reported a near complete reduction of respiratory signs in all calves three weeks later.

Clinical signs of *D.viviparous* are more commonly reported in late summer and early fall.(1) *D. viviparous* is a unique trichostrongylid nematode that lives in the bronchi and bronchioles of infected animals. Larvae (L1) are shed in feces, moult twice in the environment, and the L3 are ingested during grazing. Larvae penetrate the intestinal wall, migrate to the mesenteric lymph nodes and are carried to the lungs. The L5 mature to adulthood in the lung, reproduce, and females release larvated eggs.

D. viviparous larvae hatch prior to being coughed up, swallowed, and passed in feces. Therefore, the larvated eggs are rarely observed. Diagnosis by coprological exam requires sedimentation methods to concentrate L1 larvae, and this technique is not routinely performed in many practices. In addition, intermittent larval shedding results in false negative fecal examinations.(2) In this case, transtracheal wash achieved diagnosis by revealing an unhatched egg.

REFERENCES ***Vancouver style (max 3)***

1. Panuska C. Lungworms of Ruminants. Veterinary Clinics: Food Animal Practice. 2006;22(3):583-93.
2. McNulty SN, Strube C, Rosa BA, Martin JC, Tyagi R, Choi YJ, et al. Dictyocaulus viviparus genome, variome and transcriptome elucidate lungworm biology and support future intervention. Sci Rep. 2016;6:20316.

FIGURE/VIDEO CAPTIONS ***figures should NOT be embedded in this document***

Figure 1: Image from cytospin cytology of the transtracheal wash. The oval object is a

larvated nematode egg, 54 µm wide and 84 µm in length, consistent with an L1 stage *Dictyocaulus viviparous larvae.* The internal larvae dimensions are estimated to be 18 µm wide and 200 µm in length.
Figure 2: Transtracheal wash cytology. The cells present were a mix of The cells are mixed with numerous mononuclear cells, ciliated epithelial cells and a mix of inflammatory cells; macrophages, neutrophils, lymphocytes, and lesser numbers of eosinophils and occasional mast cells were present. An eosinophil is present in the middle of the image.

IMAGE QUIZ ***Optional (but highly encouraged) – please provide 1 or 2 sentences to describe one of the images in your article. The "Image quiz" will be published in association with your article if accepted – for a sample format visit*** *http://casereports.bmj.com/site/image-quiz.*
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MULTIPLE CHOICE QUESTION ***provide one multiple choice question based on the description above (may be "what's the likely diagnosis?")***

Which of the following is generally effective for the treatment of lungworm infection in cattle?

POSSIBLE ANSWERS TO MULTIPLE CHOICE QUESTION ***Max 6***

A. Ivermectin
B. Fenbendazole
C. Eprinomectin
D. Albendazole
E. Moxidectin
F. All of the above

CORRECT ANSWER ***With a brief explanation (the answer will also be linked to the published case)***

F is the correct choice. Macrocyclic lactones as well as benzimidazole anthelmintics are generally considered effective for the treatment of lungworm infections in cattle. The infection in this case appears to be due to the end of the duration of action of the long-acting eprinomectin administered to the calves in the spring coinciding with the fall components of the *D. viviparous* life cycle.

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Date: 10/26/2019

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1. Panuska C. Lungworms of Ruminants. Veterinary Clinics: Food Animal Practice. 2006;22(3):583-93.
2. McNulty SN, Strube C, Rosa BA, Martin JC, Tyagi R, Choi YJ, et al. Dictyocaulus viviparus genome, variome and transcriptome elucidate lungworm biology and support future intervention. Sci Rep. 2016;6:20316.