

Outbreak of sudden death in weaned calves on a New York dairy caused by *Strongyloides papillosus*

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Introduction

S. papillosus are slender hair-like worms that have a predilection for the duodenum and proximal jejunum of ruminants. The third larval stage of *S. papillosus* penetrates the skin, often in the coronary band region of the limb, and migrates to the gastrointestinal tract where it matures to the parthenogenetic adult stage. Typically *S. papillosus* infection of calves in North America is associated with clinical signs of diarrhea, dehydration, anorexia, and weight loss or poor weight gain (Thamsborg et al, 2017).

Outbreaks of sudden death associated with heavy *S. papillosus* burden are rare and have only been reported in 2-5 month old calves in Japan (Taira and Ura, 1991). These Japanese outbreaks occurred in the summer, where common conditions included sawdust bedding, high environmental temperatures, and high humidity. Experimental studies revealed the sudden death of calves with heavy worm burdens to be preceded by cardiac arrhythmias for 1-2 days and ventricular arrhythmias leading to cardiac arrest (Tsuji et al, 1992). These researchers hypothesized that *S. papillosus* may produce a cardiotoxin that leads to cardiac arrest of infected calves.

S. papillosus has recently been implicated as the novel cause of an outbreak of sudden death in weaned dairy calves on a well-managed farm in New York State. The following report describes this first documented North American outbreak of sudden death in calves caused by *S. papillosus*.

Materials and Methods

During September of 2019 a 3000-cow western New York dairy lost 17% (15/90) of previously healthy 3-month-old calves over a 2-week period to a condition characterized by the development of precocious udders followed by sudden death. Calves were recumbent with signs of respiratory distress or convulsions prior to death, or found dead. These calves were group-housed in a barn that collected standing water in the scrape alley during heavy rain and were bedded on an elevated pack of wood shavings.

Results

Four calves were submitted for necropsy to the Anatomic Pathology service at the Cornell Animal Health Diagnostic Center. These necropsy submissions were largely unremarkable on gross examination and histopathology; however, a consistent finding among deceased calves was heavy fecal loads of *S. papillosus* eggs (3,100-18,800 epg) and all heifers had vascular congestion of the udder with ductal hyperplasia. Further investigation revealed the remaining living cohort of calves were also heavily parasitized with *S. papillosus*. Ancillary diagnostics were utilized to rule out bacterial and viral pathogens, mycotoxin exposure, ionophore toxicity, and nutrient deficiency. Deworming the calves in the New York State herd with doramectin pour-on resulted in immediate cessation of sudden death, resolution of mammary enlargement, and the elimination of *S. papillosus* from fecal float evaluation. Standing water was removed from calf housing and sawdust bedding was replaced. A similar mortality event occurred on this farm during the summer of 2017, during which 33% of calves in the affected pen experienced sudden death. During the 2017 outbreak, heifers also had precocious udder development, and similar environmental conditions existed, including standing water from high rainfall and use of sawdust bedding. Postmortem results were inconclusive in 2017 and no fecal analysis was performed.

Significance

Conditions on this New York dairy appeared favorable for *S. papillosus*, and were similar to those described in Japanese outbreaks. Sawdust bedding holds high humidity and temperature, which are desirable conditions for *S. papillosus* larvae. This report provides the first account of sudden death in weaned calves caused by *S. papillosus* in North America and highlights the importance of including *S. papillosus* in the list of differentials for sudden death in young calves. More investigation is necessary to identify the exact etiology of cardiac arrhythmia leading to sudden death in these cases.