Hannah Dairy Research Foundation

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Research Paper Summary

The first report of macrocyclic lactone resistant Dictyocaulus viviparus in the UK.

Short title: **Drug resistant lungworm in the UK**

Key words: **anthelminthics; dairy; drug resistance; lungworm; parasites**

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Practical point

This short report details the first evidence of macrolytic lactone (ML) (ivermectin and moxidectin) resistant lungworm (*Dictyocaulus vivparus*) in the UK. Bovine lungworm has a negative impact on animal health and leads to substantial economic losses. Despite widespread use of long-acting MLs in grazing cattle in the UK, there have been no previous confirmed reports of resistant lungworm.

Background

Parasitic bronchitis in cattle is caused by the lungworm, *Dictyocaulus viviparus*. Animals infected with lungworm may display mild to severe respiratory distress, lack of appetite, and in severe cases, infection may result in death. *D.viviparus* is regarded as one of the most pathogenic endoparasites (lives inside the host) of UK cattle and is therefore a severe welfare and economic concern.

Outbreaks of lungworm in the UK have been increasing since 2009 and have been most pronounced in Scotland and northern England. Occurrence has shifted from late summer/autumn to any time of year; however, a peak incidence is still reported in September.

Despite a vaccine being available (Bovilis® Huskvac), there has been a decrease in its use since long-acting macrocyclic lactone (ML) anthelmintic products came on the market. Reliance on a single anthelmintic class is expected to cause resistance, as has rapidly

occurred in gastrointestinal nematode (GIN) populations. However, authors note that only one case of confirmed resistance has been reported worldwide. This short report describes the first evidence of ML-resistant *D.viviparus* in the UK.

Work undertaken

The study was undertaken on a commercial dairy in central Scotland in 2023. The region has average annual max/min temperatures of 12.7/5.7°C and an average annual rainfall of 1370.2mm over 181.2 days. Monthly meteorological data varied considerably from the previous 30 years. On average, June was 3.2°C warmer, had 13.7mm less rainfall, and 87.8 more sunshine hours. On average, July was 0.4°C warmer, had 39.6mm more rainfall, and 10.9 fewer sunshine hours.

Animals

The herd had 170 Holstein-Friesian milking cows and followers, with a total of 400 animals; no other stock was grazed on farm. The herd was closed (for over 10 years) and serviced by artificial insemination, following an all-year-round calving pattern. Dairy X Beef male calves were reared and sold to slaughter at 24–32 months, with dairy heifers retained as replacements.

Thirty-three spring-born Holstein-Friesian heifer and Dairy X Beef first grazing season (FGS) calves were turned out onto 4.4ha permanent pasture in May 2023, at a stocking density of 7.5/individuals/ha. The pasture had not been previously grazed that year and was only used for turnout of FGS calves. The calves were usually set-stocked from turnout in late-April/early-May, until mid-September, and moved to new grazing until housing in mid-October.

In the seven years prior to the 2023 grazing season, all FGS calves were treated with moxidectin at turnout and ivermectin at housing. Calves were reported to have maintained good body condition and growth rates in previous years, there were no confirmed diagnoses of parasitic bronchitis on farm and lungworm was not a significant concern.

Diagnosis of lungworm

The farm was recruited as part of a study investigating anthelmintic resistance in GIN using the faecal egg count reduction test (FECRT). Additionally, faecal samples were collected for lungworm detection (modified Baermann filtration technique). The 33 calves were not wormed

at turnout, and faecal egg counts (FEC) and body condition were monitored fortnightly from early-July 2023 until the FEC reached a group average of ~100 eggs/gram (epg). During this time, periodic lungworm Baermann filtrations were also performed. Fresh faeces were collected from pasture and Baermann filtrations were performed within four hours of collection by adding 30g of faecal material to a 12-ply gauze, forming a pouch, and suspending it in a glass beaker of tepid water overnight. The following morning, the faecal material and most of the suspension were removed without disturbing the sediment. The sediment and washings were added to a petri dish, and larvae identified using a microscope.

On 21st July 2023, the group mean FEC reached 94 epg. Fourteen days later (Day 0 in the FECRT), half of the group (16 individuals) were treated with moxidectin by subcutaneous ear injection and the other half (17 individuals) with subcutaneous ivermectin. Individual animal weight was estimated by weigh band and ranged from 190-230kg. Individual per-rectum samples were collected from all animals for FEC on day 0 and 15. From post-treatment groups, nine samples per group were randomly selected and processed for Baermann filtration.

Fifteen Baermann filtrations were performed on a random subset of samples from the latter two FEC monitoring visits (collected from pasture), and no larvae were detected; these were performed 21 and 14 days before the FECRT. During these visits, calves were in good body condition and showed no clinical signs of parasitic bronchitis or gastroenteritis. On the day of treatment, calves were in good body condition, showed no clinical signs, and the farmer was happy with their performance. On day 15 post-treatment, several calves displayed clinical symptoms of parasitic bronchitis after they were moved to the holding pen: intermittent coughing with increased frequency. The farmer noted that some calves had developed diarrhoea, and the group was not as “bright”. Of 18 per rectum samples from the FECRT that were chosen for Baermann analysis, 12 were positive for lungworm: eight post-ivermectin-treatment and four post-moxidectin-treatment. The larval counts of the lungworm positive individuals varied greatly, ranging from 2-340.

Following identification of lungworm larvae in both ivermectin and moxidectin treated groups, the case was reported to the Veterinary Medicines Directorate and the pharmaceutical companies as an adverse event with a suspected lack of efficacy. All calves were treated with levamisole, and a supportive treatment of flunixin. They were moved from

the “infected” pasture to “clean” grazing (silage aftermath that heifers had grazed). Fourteen days post-levamisole-treatment, a Baermann filtration was conducted on faecal samples from 10 random individuals, and no larvae were recovered. Calves maintained good body condition, although a minority still coughed intermittently.

Conclusions

The prolonged protection offered by MLs, especially moxidectin, coupled with ease of application, make them popular for controlling lungworm and GIN in calves. However, authors note that producers and veterinary practitioners must consider the possibility of anthelmintic resistance in lungworm and use sustainable parasite control strategies (www.cattleparasites.org.uk). In particular, they suggest that vaccination against lungworm infection in calves can be used successfully alongside other management strategies to reduce anthelmintic usage.

Reference

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