

identifying and propagating sheep resistant to parasitism. Researchers in New Zealand have developed a commercial test (CARLA<sup>®</sup> Saliva Test, AgResearch, New Zealand) that identifies animals with increased immunological resistance to GIN. The test measures salivary IgA targeted against carbohydrate larval antigen (CarLA) – a structure found on third-stage GIN larvae. New Zealand data have shown that sheep with high anti-CarLA IgA have 20–30% lower faecal egg counts (FEC) and reduced clinical parasitism, compared to individuals with low anti-CarLA IgA. It remains unclear how CarLA testing performs in Canada, where climate and production practises differ significantly from New Zealand. To date, CarLA testing has been evaluated in one Canadian flock and shows promise, however there is need to demonstrate utility under more diverse conditions.

### Material and methods

Eighteen commercial sheep flocks were recruited for the study; farms varied by geography, size, breed, pasture management and parasite control practises. In mid-summer 2022, farms submitted ten faecal samples from lambs for FEC to verify GIN within their flock. In November 2022, thirty replacement ewe-lambs were randomly selected per farm. Each animal was weighed, body condition scored (BCS), CarLA tested, and a FEC was performed. Positive faecal samples on each farm were pooled (10:1) for larval (L<sub>1</sub>) culture to facilitate nemabiome sequencing. The study animals, and their future offspring, will be followed for twelve months, and the productivity of individuals with high anti-CarLA IgA will be compared to those with low anti-CarLA IgA.

### Results and discussion

The average FEC per farm was 664 eggs per gram (epg), with substantial variation between farms, ranging from 3 – 3152 epg. Similarly, there was considerable variation in FEC between individuals within a farm; the average maximum count was 1977 epg, and the average minimum count was 84 epg. FEC variability within a flock reflects differences in exposure, intermittent egg shedding, and immunity. Data collection is underway for the November 2022 sampling period and results are expected in January 2023.

### Conclusion and implications

The FEC data reinforce the importance of sampling multiple animals when monitoring parasitism in sheep flocks. Due to variation in egg shedding between individuals, an average FEC from ten individuals likely provides accurate representation of parasite burdens on farm. Once available, individual CarLA data will be compared with FEC, weight and BCS to determine if sheep with high anti-CarLA IgA outperform their low-CarLA IgA counterparts.

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### O-160

#### Prevalence of the resistance of gastrointestinal nematodes to benzimidazoles assessed by the faecal egg count reduction test in Polish goat herds

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### Introduction

Parasitic infections, especially caused by gastrointestinal nematodes (GIN), are one of the main causes of economic losses in goat farming worldwide. Their control is mainly based on the use of anthelmintics. The widespread use of these products has led to the emergence of drug-resistant parasite strains. One of the most commonly applied tests for the detection of anthelmintic resistance (AR) is the faecal egg count reduction test (FECRT). The aim of this study was to determine the prevalence of resistance to benzimidazoles (BZ) in the Polish goat herds by using an in vivo FECRT, which is useful especially in large-scale epidemiological surveys.

### Material and methods

This cross-sectional study was conducted from April 2021 to November 2022 and enrolled 27 dairy goat herds (370 goats) scattered over the entire country. FECRT was performed according to the recent recommendations published by Kaplan (2020). Goats were treated with recommended doses of albendazole. The number of animals enrolled in the treatment group in each herd varied from 10 to 20 animals, depending on the herd size. The faecal egg count reduction (FECR) was assessed between pre- and post-treatment samples from treated animals. Percent egg reduction (%FECR) was calculated according to the formula:  $\%FECR = 100 \times (1 - [T1/T0])$  where T0 and T1 were the arithmetic means of faecal egg count (FEC) of the treated group before and after treatment, respectively. The parasite population was considered resistant if %FECR was <95%. Larval cultures were prepared for each group and identified to the species level based morphological features of the third-stage larvae (L3).

## Results and discussion

The resistance to BZ was indicated by FECRT in 24 out of 27 goat herds examined in the study (89%; 95% confidence interval: 72% – 96%). The %FECR in the herds with indicated resistance to BZ ranged from 23% to 92%. In only 3 herds the %FECR was >95% (specifically: 96%, 97%, and 100%). The main GIN species detected in 100% post-treatment faecal samples was *Haemonchus contortus*.

## Conclusion and implications

Our study shows that resistance to BZ is widespread in goat population in Poland. The prevalence of BZ resistance assessed by the *in vivo* FECRT is in line with results obtained from our previous studies based on *in vitro* AR detection methods, in which the prevalence of resistance to BZ was also 89%.

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## Reference

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## O-161

### Nemabiome metabarcoding shows varying levels of genetic diversity in anthelmintic-resistant gastrointestinal nematodes

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## Introduction

Gastrointestinal nematodes (GINs) are a substantial threat to the livestock industry, hindering the production of milk, meat and wool. Faecal egg count reduction tests (FECRTs) are performed to detect phenotypic resistance of GINs to anthelmintic drugs. These tests give important data regarding the anthelmintic efficacy, but do not provide information about the dynamics and diversity of the resistant GIN species. In the current study, we undertook a molecular analysis of the GIN populations from pre and post-treatment samples collected from sheep farms in southeast England.

## Material and methods

On each of the 18 farms, faecal samples were collected from three groups (10 lambs each) at the time of treatment with recommended doses of ivermectin, levamisole, and a combination of both; and at 14 days post-treatment. After the faecal egg counts (FECs), eggs were set up for hatching and DNA extraction from 1st stage larvae. The DNA was used as a template for nemabiome metabarcoding, followed by next-generation Illumina sequencing. The sequencing data were analysed to identify and quantify the GIN species present, and the amplicon sequence variants (ASVs) of each species. The results were confirmed by blasting the ASVs to Genbank sequences, and a maximum likelihood (ML) tree was generated. Finally, principal component analysis (PCA) was performed to show differences between the sampling groups.

## Results and discussion

The FECs showed a 30% to 99% reduction in the post-treatment samples, with the combination generally being the most successful treatment. Only a few samples showed more than a 95% reduction, indicating widespread anthelmintic resistance.

We identified nine GIN species in pre-treatment samples, with *Haemonchus contortus*, *Teladorsagia circumcincta*, and *Trichostrongylus vitrinus* being the most common. The post-treatment results showed a dominance of *T. circumcincta*, followed by *Trichostrongylus colubriformis*, while *H. contortus* and *T. vitrinus* were absent or greatly reduced. All three treatment groups showed similar results. The ML tree revealed potentially resistant amplicon sequence variants (ASVs) of each species. The PCA plots demonstrated a significant difference between pre-treatment and post-treatment samples ( $P < 0.001$ ), and between different treatment groups ( $P = 0.03$ ).

## Conclusion and implications

The study combines FECRTs with molecular analysis of anthelmintic-resistant species in sheep and provides useful information about the value of anthelmintic drug combinations in the control of anthelmintic-resistant populations. Different GIN species showed different levels of resistance to the tested drugs; hence employing next-generation molecular techniques may help to determine the most suitable drugs or