

Selecting Sheep for Parasite Resistance Using Fecal Egg Counts

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Abstract

The parasitic worm *Haemonchus contortus* is a major problem in the small ruminant industry, resulting in substantial deaths and morbidities. By measuring the fecal egg count (FEC), we can detect worm load in the sheep by giving an estimate of how many eggs are in one gram of feces. Due to haphazard use of anthelmintics in the past, *Haemonchus* has developed resistance to said drugs. Nowadays, a useful tool in providing parasite resistance to our sheep is a well-maintained breeding program.

Fecal egg counts were collected at Breezy Ridge Farm in Georgina, ON prior to the commencement of this project. Flock data was extracted from GENOVIS. Although no significant results were found after performing correlation and ANOVA tests, trends were observed, including a steady decrease in the flock FEC median, suggesting the breeding program is producing results. In the coming months, FECs will be collected and further tests will be performed to assess the progress of the Breezy Ridge breeding program and to investigate the use of other measures to select for parasite resistance.

Genetic Parameters for Ewe Productive Traits in Rideau Sheep

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Abstract

High prolificacy in ewes can be negatively associated with lamb early survival and vigor. Multiple births are common in Rideau ewes with some occasional quadruplets and quintuples. Due to the insufficiency of colostrum and milk produced by ewes with a large litter size, extra lambs may require additional labor and cost for foster rearing. The objective of this research is to explore phenotypic and genetic parameters for ewe productivity in Rideau sheep. Data for 63,706 Rideau sheep recorded in GENOVIS is being analyzed by using a multiple-trait mixed model, which includes several reproductive, maternal, and growth traits, such as lambing interval, age at first lambing, number of lambs born per ewe lambing, number of lamb weaned per ewe, total litter weaning weight per lambing, and genetic contribution to post weaning growth. Results could help to optimize genetic selection for ewe productivity in Rideau sheep.

Genomics as a tool to increase profitability in the Canadian sheep industry

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Abstract

Traditional genetic evaluations have played an important role in improving performance and, consequently, profitability in the Canadian sheep industry. These genetic evaluations rely mainly on individual phenotypic records and pedigree information. However, with the development of genomics, new tools have become available such as genomic selection (GS), which exploits associations between thousands of markers distributed over the genome and economically important traits. The use of genomic information has the potential to increase the accuracy of genetic evaluations in young animals. Therefore, it accelerates the selection cycles and offers the opportunity to increase selection response per unit of time. Through GS, faster genetic gains can be achieved especially for traits measured-later-in-life, for traits that cannot be measured directly on breeding candidates and for difficult-to-measure traits such as parasites and diseases resistance. Despite the observed progress in applying genomics in the sheep industry in other countries, such as New Zealand, currently genomics is not applied to Canadian sheep genetic evaluations and breeders risk lagging behind global competitors. Therefore, our main objective is to discuss with the industry some opportunities to further investigate and make GS feasible for the Canadian sheep industry and present in more details its potential benefits to the industry.

On Farm Investigation of Small Ruminant Mortalities

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Abstract

Strides towards flock health management improvements are impaired by infrequent on-farm post-mortems of adult sheep. This may be due to low animal value, poor quality sample submission, and poor understanding of the value of post-mortem and in knowing why the animal died. This represents a tremendous lost opportunity for improvement in flock health and management.

This project involves development of a distance support system for producers and veterinarians performing on farm post-mortems for adult sheep. The goal of the system is to increase and improve the quality of samples submitted to the Animal Health Laboratory, the level of surveillance of disease in adult sheep in Ontario, the information provided back to sheep producers and their veterinarians regarding their flock health, and the knowledge transfer between veterinarians and sheep producers. This will allow them to develop appropriate health management plans which can decrease mortalities and therefore increase producer profits.

Quantitative and qualitative research methods will be used to generate in-depth understanding of stakeholders' experiences, motivations and perceived barriers with the system. Additionally, we will investigate producer and veterinarian attitudes towards flock health services, including what is perceived to be of value, and perceived motivations and barriers to flock health program adoption.

FAMACHA Scoring: A Tool for Improving Parasite Control in Sheep

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Abstract

The barber pole worm (*Haemonchus contortus*) is an economically important parasite affecting sheep production on pasture. Sheep that are affected by this parasite can show anemia (reduction in the number of red blood cells), because the worms feed on the animal's blood that is released when the worm lacerates the abomasum wall. FAMACHA is a tool that matches the colour of the eye mucous membranes with a laminated colour chart showing 5 categories that correspond to different levels of anemia. Therefore, using FAMACHA allows small ruminant producers to make deworming decisions based on an estimate of the level of anemia in their animals, associated with a barber pole worm infection. Other conditions such as Hookworms, Liver Flukes, infections and nutritional deficiencies can also cause anemia, therefore FAMACHA is currently recommended to be used in conjunction with fecal egg counts when monitoring animals for parasites; however this adds an expense to the producer. Further research needs to be carried out to find measures that are easier and less expensive to collect than fecal egg counts, which would allow for more of a widespread adoption throughout the small ruminant industry for indicating parasite resistance.

Investigation of the immune response of sheep to gastrointestinal nematodes under Ontario grazing conditions

Research team Emma Borkowski, Andrew Peregrine, Niel Karrow, Paula Menzies

Abstract

Infection with gastrointestinal nematode parasites (GINs) and in particular *Haemonchus contortus* has a serious impact on sheep health and productivity in Ontario. Resistance of *H. contortus* to dewormers is widespread. Alternative control strategies are needed; one such strategy is to select animals for superior ability to mount an immune response. This project will describe how Ontario sheep develop immunity to GIN infections by following a group of ewe lambs over an 18 month period, including two grazing seasons and one lambing and lactation event. Immunity will be measured directly using the CarLA® Saliva Test (AgResearch Ltd.), which measures GIN-specific IgA antibody in saliva, and indirectly with change in fecal egg count (FEC). Level of GIN infection will be monitored using FEC and changes in blood and clinical parameters. Also, lambs from the University of Guelph Ponsonby Research flock, pre-selected for stress or immune responses, are being co-grazed with these lambs to determine if these phenotypes influence immunity to GINs. This information will be used in future studies to determine the heritability of these immune traits and their potential role in genetic selection.

Genetic selection based on enhanced immune responsiveness to gastrointestinal nematodes in sheep

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Abstract

Gastrointestinal nematode (GIN) infections in grazing sheep are a major cause of morbidity and mortality in Ontario, resulting in significant economic loss to sheep producers. Due to increasing anthelmintic resistance, there is a need for different approaches to control this parasite. Sheep selected for ability to resist GIN infections can be used to facilitate controlling these infections. The objective is determining if sheep, which are raised under Ontario grazing conditions and parasite challenges, differentially develop immunity to GIN, including *Haemonchus contortus*. Tracer lambs from the University of Guelph Ponsonby flock that were selected based on their overall stress and immune response, are being grazed with a commercial flock in Ontario, and *H. contortus*-specific IgA and fecal egg counts (FEC) are being measured over time to better understand how sheep develop immunity to this highly pathogenic parasite. Tissue-specific gene expression profiles, as well as the identification of specific polymorphisms in the genome such as Single Nucleotide Polymorphism (SNP), will also be characterized by RNA-Sequencing and associated with enhanced immune responsiveness. It is hoped that this comprehensive information, combined with other ongoing projects, can be integrated into genetic programs to develop approaches for genetic selection in sheep industry breeding plans for selecting genetically resistant animals.

Development of a vaccine against parasitic abortion in sheep

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Abstract

The goal of this project is to develop a vaccine against *T. gondii* for use in sheep in Canada.

Factors affecting carcass traits of Canadian heavy lambs

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Abstract

The profitability of meat lamb production is strongly dependent on carcass traits. Lambs marketed at an ideal weight, age, and finish are of increased value to processors and yield greater producer profit under a price grid classification system. Currently, little is known about the average carcass trait merit of Canadian lambs. The aim of this research is to test the significance of non-genetic factors, such as sex, breed group, and litter size, on average carcass performance of Canadian heavy lambs. Carcass weight and quality data was collected on over 20,000 lambs marketed through Quebec's Heavy Lamb Sales Agency between 2010 and 2012. Analyses were performed on 7,074 carcass records from lambs enrolled in GENOVIS. The significance of non-genetic factors on hot carcass weight, fat depth and saleable meat yield were tested using analyses of variance. Non-genetic factors could influence the ideal carcass weight and fatness at which lambs should be marketed to maximize producer profit. Thus, the performance for hot carcass weight, fat depth and saleable meat yield were compared between breed groups, litter sizes and sexes. Future research will use the significant non-genetic factors in the estimation of carcass trait heritabilities and the development of terminal selection indexes.

Nutritional value and integration of hybrid willow and poplar as fodder for sheep

Research team C. O'Reilly, M. Parr, and S. Fraleigh

Abstract

To determine if coppiced willow and/or poplar are acceptable browse for sheep, and if any species/variety preferences exist.

To determine if the quality of new tree regrowth is adequate to meet the nutritional demands of a ewe flock.

Sheep were rotated through three paddocks planted with biomass-producing varieties of willow and poplar. The flock was monitored daily to determine how early and completely they browsed the new leaves and stems. The order and extent to which they ate each variety was noted, and ranked from most to least preferred. The ewes were given a mineral supplement to balance their arboreal diet. The sheep were moved when browse became limited and flock behaviour changed, which was an average of 5.75 days.

Sheep demonstrated clear varietal preferences. Nutritional data is being analyzed and results will be included on the poster. Trees may provide alternative forage for sheep during the "summer slump" in pasture growth.

Determining the prevalence and distribution of Eimeria species infecting lambs on Ontario sheep farms

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Abstract

Coccidiosis caused by the protozoan parasite Eimeria has not been systematically studied in Canada since 1985 (Dohoo et al., 1985), yet a survey by the Ontario Animal Health Network has recently identified coccidiosis in lambs as a top clinical issue (Ontario Animal Health Network, 2016). There are ~11 named Eimeria spp. that infect sheep and at least two, E. crandallis and E. ovinoidalis, are considered pathogenic (Taylor and Catchpole, 1994). The identification of individual species, particularly those that are most pathogenic, is information crucial for effective and targeted anticoccidial treatment. Less pathogenic species can be excreted at large numbers without causing clinical effects therefore it is difficult to determine the actual severity of infection using conventional oocysts enumeration methods (McDougald, 1979). The objectives of this project include, 1) to develop an economical assay for the identification of Eimeria species present in feces and 2) determine the prevalence and distribution of Eimeria species in lambs on Ontario sheep farms. Collectively, the parasite identifications and enumerations will aid in identifying specific management practices, feed, and treatment options that have the greatest potential to decrease the impact of coccidiosis.

Prevalence of small ruminant lentivirus and Mycobacterium avium subsp. paratuberculosis co-infection in Ontario dairy sheep and dairy goats

Research team Nancy Stonos

The small ruminant lentiviruses (SRLV) consist of the maedi-visna virus (MVV) and the caprine arthritis encephalitis virus (CAEV). Infection with SRLV causes a variety of chronic inflammatory conditions that limit production. Johne's disease is caused by Mycobacterium avium subsp. paratuberculosis (MAP) is also a production-limiting disease of sheep and goats, causing severe inflammation of the small intestine leading to chronic wasting. Previous studies have indicated that both SRLV and MAP infections are widespread in Ontario small ruminants.

This study was conducted to estimate the prevalence of SRLV and MAP co-infection. Serum samples that had been previously tested for MAP infection were used to detect SRLV. The prevalence of co-infection was low, with 3.4% (1.9-5.9) and 14.3% (11.6-17.5) of sheep and goats respectively, testing positive for both infections. However, co-infection is widespread with 36.8% (19.1-59.1) and 71.4% (52.8-84.9) of sheep and goat farms with one or more co-infected animal. A significant association was found between SRLV and MAP ($p=0.021$), suggesting that co-infected goats may be more likely to shed MAP in their feces. This study also confirmed a high prevalence of SRLV infection in Ontario with 41.3% (36.3-46.5) of sheep and 80.1% (77.7-84.2) of goats testing positive for SRLV.