Project Summary

Studies on gastrointestinal nematodes of alpacas

Objectives

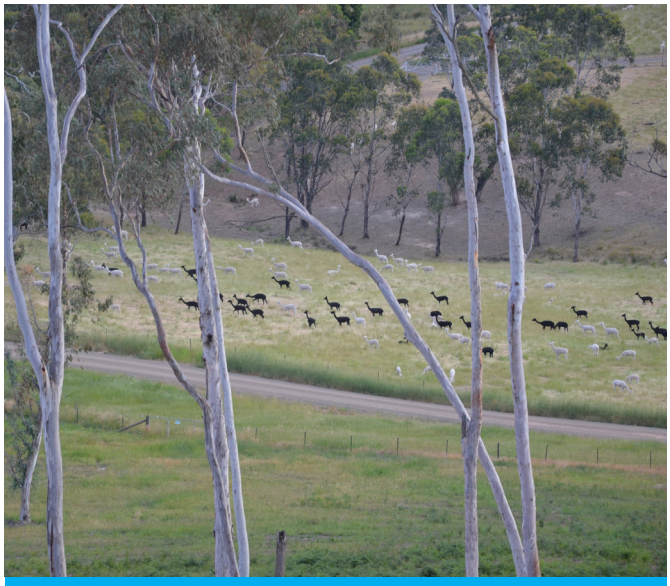
1. To assess the worm control practices used by alpaca farmers in Australia by conducting a questionnaire survey
2. To determine the prevalence of gastrointestinal nematode of alpacas in various climatic zones in Australia, using traditional and the latest molecular diagnostic methods
3. To undertake field efficacy studies to determine the status of anthelmintic resistance in gastrointestinal nematodes of alpacas
4. To train a research higher degree (MPhil/PhD) student

Background

Alpacas (*Vicugna pacos*) are native to The Altiplano (Andean Plateau) region in South America. For centuries, alpacas and llamas have been used by Andean people for their socioeconomic value. Recently, the commercial farming of alpacas has also been exploited outside South America, mainly in Australia, Canada, Europe, New Zealand, the UK and the USA, for their fibre, meat and hides. Additionally, alpacas are kept as guard animals in sheep farms, or simply for life style.

As with other grazing livestock species, gastrointestinal nematode (GIN) infections are considered as one of the important challenges alpaca farmers face globally, causing diarrhoea, reduced growth rate, anaemia and mortality. For instance, a wide range of GINs have been recorded in alpacas from Australia, Europe, New Zealand, the UK and the USA. Although economic losses due to parasitism in alpacas have not been quantified in intensive grazing systems, it is expected that parasitic gastroenteritis in alpacas would result in substantial production losses.

Currently, the control of nematode infections in alpacas relies mainly on the use of chemicals (anthelmintics), although no anthelmintic is registered for use against GINs in these animals in Australia. However, anthelmintic resistance (AR) is now recognised as an important threat to the health, productivity and welfare of alpacas globally as limited information is available on appropriate dose rates and routes of administration of anthelmintics used in alpacas.



Although Australia has the largest alpaca population (>450,000) outside South America, very little is known about the epidemiology and control of GINs in alpacas. Furthermore, there is no information available on parasite control practices used by Australian alpaca farmers.

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Methods used

Assessment of worm control practices used by Australian alpaca farmers: A questionnaire was conducted using an online programme, Research Electronic Data Capture. The questionnaire contained questions about farm demography and general husbandry practices of alpacas, farmers' knowledge about GINs and their importance, the use of worm control strategies and anthelmintics, and grazing management. The questionnaire was first validated using a pilot survey before conducting the definitive survey. The participants of the survey were registered members of the Australian Alpaca Association (AAA) and their participation in the study was entirely voluntary. The questionnaire survey was approved by the Human Ethics Committee of the University of Melbourne (UoM).

Epidemiology of gastrointestinal nematodes of Australian alpacas: To determine the prevalence of GINs of alpacas in Australia three types of studies were conducted. In addition, a new DNA-based test was developed to detect nematode DNA in the alpaca faeces. The collection of samples from alpacas was approved by the Animal Ethics Committee of the UoM.

- Cross-sectional epidemiological studies: This study involved a national cross-sectional survey of GINs of alpacas to establish baseline data on their epidemiology in Australia. A total of 1,545 fresh faecal samples from 92 farms were collected from both sexes of alpacas and processed for faecal egg counts (FECs) and identification of nematodes using a newly developed DNA-based test.

- Longitudinal epidemiological studies: This study involved a longitudinal coproscopical study on 13 alpaca farms in four climatic zones (summer rainfall, winter rainfall, non-seasonal rainfall and Mediterranean-type rainfall) of Australia to understand the epidemiology of GINs of alpacas. A total of 1,688 fresh faecal samples were collected from both sexes of alpacas from May 2015 to April 2016, and processed for FECs and identification of nematodes using a newly developed DNA-based test.

- Examination of gastrointestinal tracts of alpacas: In this study, one hundred gastrointestinal tracts of alpacas were examined to assess the burden and to identify the species of nematodes present in Australian alpacas. Faecal samples were collected from 97 alpacas and processed for FECs. For identification of nematodes, both DNA-based test and morphological technique were used.

- Development of a new diagnostic tool: This study involved a modification of two existing DNA-based tests (multiplexed-tandem polymerase chain reaction (MT-PCR) assays), originally developed for the GINs of sheep and cattle, to reliably detect and differentiate the common genera/species of GINs in the faeces of alpacas.

Efficacy of commonly used dewormers against GINs of alpacas: This study aimed to assess the existing worm control practices used by Australian alpaca farmers and to quantify the efficacy of commonly used anthelmintics against GINs of alpacas. An online questionnaire survey was conducted to assess current worm control practices on 97 Australian alpaca farms, with an emphasis on the use of anthelmintics. Of this group of 97 alpaca farms, 20 were selected to assess the efficacy of eight anthelmintics and/or their combinations (closantel, fenbendazole ivermectin, monepantel, moxidectin and a combination of levamisole, closantel, albendazole, abamectin) using the faecal egg count reduction test (FECRT). A multiplexed-tandem PCR (MT-PCR) was used to identify the prevalent nematode genera/species.

Training of a research higher degree student: Mohammed Haronur Rashid completed his PhD thesis by undertaking his research project on gastrointestinal nematodes of Australian alpacas.

Key findings

1. The worm control practices survey provided insights into the current husbandry and worm control practices used by Australian alpaca farmers of different herd sizes. Farmers' knowledge about GINs of alpacas, their diagnosis, treatment and control, and grazing management are important in the sustainable control of worm control in alpacas.

2. This study generated new knowledge about the GINs in Australian alpacas. Australian alpacas are affected by camelid-specific worm species, and sheep and cattle worms. Parasitic gastroenteritis can lead to diarrhoea and/or anaemia, illthrift, loss of production (reduced growth, less wool production, poor fertility) and death of alpacas. Alpacas of all ages are affected by worms in all climatic zones of Australia, across all farm sizes, throughout the year.

3. There is a widespread AR in GINs of Australian alpacas. The field efficacy study of dewormers against GINs of alpacas revealed that monepantel (Zolvix®) and a dewormer containing four active ingredients (Q Drench®) were effective whereas fenbendazole, ivermectin, moxidectin and closantel used individually were ineffective dewormers.

4. This study established a new high-throughput, rapid and cost-effective DNA-based test for the accurate diagnosis of the GINs of alpacas. Alpaca farmers can use this service either through The University of Melbourne or other commercial diagnostic laboratories offering this service.

5. A conventional McMaster technique for assessing worm burden in alpacas was compared with a new diagnostic test FECPAKG2® which revealed that the latter technique is user-friendly and can be used by farmers to perform FECs on their farms.

6. This project supported Australia's capacity building in science by the training of a new scientist in one of the emerging animal industries of Australia.

7. This project resulted in the publication of seven original peer-reviewed scientific papers which have been/will be published in peer-reviewed scientific journals.

8. Findings of the project were presented at national and international meetings/conferences. In addition, regular presentations were delivered at regional and national meetings of the AAA.

9. A summary of the key findings of this project was published in the AAA magazine in August 2018.

Recommendations

1. To optimise health and production of alpacas, farmers should monitor worm burdens in their herds by:

- regularly performing FECs, particularly in weaners and tuis or when alpacas lose weight/decrease body condition/exhibit diarrhoea or anaemia.
- identifying worm species on each farm using larval culture or DNA testing of alpaca faeces.
- performing FECs in co-grazing cattle, sheep and goats simultaneously as they share many worm species.
- interpreting FEC results in conjunction with respect to individual farm management (stocking rates, season, pasture length, body condition, age of alpacas).
- using alternate methods (such as FAMACHA®) to assess the severity of anaemia caused by blood sucking nematodes (e.g. Barber's pole worm)

2. Currently, no dewormer is registered for use in alpacas in Australia, so all use is off-label and must be used with caution. Withholding periods from other livestock species do not necessarily apply to alpacas.

3. If using veterinary chemicals Alpaca farmers should seek veterinary advice to ensure legislative compliance.

4. Many dewormers used to treat alpacas are ineffective (likely due to resistance of worms to the active ingredients). Farmers are encouraged to use dewormers having at least two chemicals/actives when treating alpacas for worms. Seek veterinary guidance as necessary.

5. Weigh alpacas to determine appropriate dose of a dewormer.

6. Calibrate drench guns to ensure accurate dosage.

7. Farmers should monitor efficacy of dewormers by performing FECs 10-14 days after deworming to ensure efficacy (☙ 95% reduction in FECs).

8. Newly introduced alpacas should receive an effective dewormer ("quarantine drench") prior to entry into the herd.

9. Grazing management and pasture spelling are important adjuncts to worm control programs to minimise the need for deworming and delay the development of AR.

10. Alpaca farmers are encouraged to modify current practices to improve the health and welfare of alpacas in their care and reduce the risk of selecting worms for their resistance to commonly used dewormers on their farms by following the above recommendations.

11. More research is required to determine cut-off values for FECs when treatment with a dewormer is indicated.

12. More research is needed to determine the 'correct' dose of dewormers to be used in alpacas. Furthermore, alternative control strategies such as the use of available vaccine (i.e. Barbervax®) against Barber's pole worm and the use of Bioworma® for a biological control against GINs of alpacas should be investigated.

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13. In order to effectively share the findings of the project, a proposal for holding extension workshops, webinars and seminars have been submitted to the AgriFutures Australia and the AAA for funding.

14. Paraboss is an invaluable resource for the control of worms, flies and lice in sheep and goats in Australia. Alpaca farmers are encouraged to regularly seek information from Wormboss (www.wormboss.com.au) as alpacas share a number of GINs with sheep and goats. In addition, efforts will be made to make findings of this project available through Wormboss.

Peer-reviewed scientific research publications

Rashid MH, Vaughan JL, Stevenson MA, Campbell AJD, Beveridge I, Jabbar A, 2018. Anthelmintic resistance in gastrointestinal nematodes of alpacas (Vicugna pacos) in Australia. Parasitites & Vectors, 11:388. (open access)

Rashid MH, Gebrekidan H, Jabbar A, 2018. Multiplexed-tandem PCR (MT-PCR) assay to detect and differentiate gastrointestinal nematodes of alpacas. Parasites & Vectors, 11:370. (open access)

Rashid MH, Stevenson MA, Waenga S, Mirams G, Campbell AJD, Vaughan JL, Jabbar A, 2018. Comparison of McMaster and FECPAKG2 methods for counting nematode eggs in the faeces of alpacas. Parasites & Vectors, 11:278. (open access)

Rashid MH, Stevenson AM, Campbell AJD, Vaughan JL, L, Beveridge I, Jabbar A, 2018. An assessment of worm control practices used by alpaca farmers in Australia, submitted.

Rashid MH, Vaughan JL, Stevenson AM, Campbell AJD, Saeed MA, Indjein L, Beveridge I, Jabbar A, 2018. Epidemiology of gastrointestinal nematodes of alpacas in Australia I: Cross-sectional studies, submitted.

Rashid MH, Stevenson AM, Vaughan JL, Saeed MA, Campbell AJD, Beveridge I, Jabbar A, 2018. Epidemiology of gastrointestinal nematodes of alpacas in Australia II: Longitudinal studies, submitted.

Rashid MH, Beveridge I, Vaughan JL, Jabbar A, 2018. Worm burdens and associated histopathological changes caused by gastrointestinal nematodes in alpacas from Australia, submitted.

Read the final report:

www.agrifutures.com.au/product/studies-on-gastrointestinal-nematodes-worms-of-alpacas/

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