sediment 1 at all three durations, and increased sedimentation time also did not influence total S. edentatus recovery. S. edentatus larvae may be more mobile than other species and capable of swimming above the traditional sediment 1 for a prolonged period of time; Therefore, collecting and examining the entire contents of the Baermann apparatus is necessary when desiring an increased diagnostic sensitivity and negative predictive value in diagnosing S. edentatus infections while traditional methods are inadequate for S. vulgaris diagnosis and Cyathostominae recovery. Although there is a need for future research to evaluate the risk of selection bias at differing sedimentation times among individual cyathostomin species and to determine more appropriate techniques for S. edentatus recovery, these data will allow researchers and practitioners to make more informed decisions in choosing appropriate larval recovery techniques, balancing recovery, time, and effort.

101 Combination Deworming- a solution or exacerbation?
J.A. Scare*, E.T. Lyons, M.K. Nielsen
MH Gluck Equine Research Center, Department of Veterinary Science, University of Kentucky, Lexington, Kentucky, USA

Cyathostominis are the most clinically important endoparasites of equids. Emergence of the encysted larvae from the intestinal mucosa causes a potentially fatal illness, known as larval cyathostomosis, characterized by intestinal inflammation, diarrhea, weight loss, and colic. Numerous studies have shown high levels of resistance present in cyathostomin populations against benzimidazoles and tetrahydropyrimidines. Thus, the macrocyclic lactone class is left as the only efficacious treatment for cyathostome infection, and signs of emerging resistance have been reported for this drug class as well. Evidence towards resistance reversal comes from a five year simulation study in New Zealand regarding combination deworming in sheep. It found that the resistance to individual anthelmintics decreased when the parasites were treated with combination drugs for several years. The goal of the present study was to provide information regarding the efficacy of combination deworming against equine cyathostomin parasites where resistance to both benzimidazole and the tetrahydropyrimidine type drugs already exists. Prior to each anthelmintic treatment, the ponies were weighed on an electronic scale and a fecal sample was collected. Post-treatment samples were collected every two weeks for eight weeks. All samples have been processed using the mini-FLOTAC technique. An eight-week clean out period will follow each treatment. The beginning of the study was dedicated to providing a baseline efficacy of oxibendazole (oxi) and pyrantel pamoate (pyr) when administered individually (Treatment 1). The ponies were ranked based on fecal egg count (FEC), allocated into groups of two, and randomly assigned to one of the two treatment groups. The process was repeated over another eight week period with the groups reversed (Treatment 2). Hereafter, all the ponies were treated every eight weeks with both drugs to determine their combined efficacy and compare it to each individual drug group. After one year of administering combination treatment, the ponies will receive individual treatments again to assess any changes in their efficacy. Additionally, we will be able to observe seasonal effects. Currently, data has been collected up to two week post combination treatment (Treatment 3). Data is still being generated at the time of writing this abstract and will be presented at the conference. The group mean percent efficacies and 95% confidence intervals are as follows: Treatment 1 Oxi: 51.85% ± 16.27%, Pyr: 57.25% ± 14.96%; Treatment 2 Oxi: 62.27% ± 17.65%, Pyr: 44.27% ± 21.76%; Treatment 3 Combination: 73.28% ± 15.76%. It appears the combination treatment is more efficacious, but using the additive effect formula, we would expect the combination treatment to be around 79% for treatment 1 and 2, however in actuality the combination is slightly below this value. This study will be continued over the next few years to determine the efficacy of the combination deworming approach as well as each anthelmintic by itself.

067 Visualizing ascarid worm burdens in foals by transabdominal ultrasonography
M.K. Nielsen* 1, J.M. Donecker 2, C.K. Fenger 3
1 M.H. Gluck Equine Research Center, University of Kentucky, Lexington, KY 40546; 2 707 Parkway Boulevard, Reidsville, North Carolina, USA; 3 Equine Integrated Medicine, PLC, 4904 Ironworks Road, Georgetown, Kentucky, USA

Ascarid parasites pose a significant threat for small intestinal impaction and rupture. The post-surgical long-term survival is reported in the range of 9-60%. Anthelmintic treatment has been identified as a significant risk factor for these impactions, and there is a need for identifying foals infected with large burdens prior to treatment. However, ascarid egg counts suffer from a low negative predictive value and do not correlate with the worm burden, so they cannot reliably detect a heavy infection. Ultrasonography represents a diagnostic imaging modality frequently applied in clinical case work-ups. However, it has not yet been evaluated as monitoring technique in otherwise healthy foals. This study aimed to develop and evaluate a transabdominal scoring technique for the assessment of ascarid parasites present in the small intestine of naturally infected foals. Ten foals underwent biweekly repeated transabdominal ultrasonographic examination over the course of 6 months. Ascarid parasites appear as highly echogenic structures with the cuticle forming characteristic double parallel lines (Fig. 1). A scoring system was developed going from 1 through 4, with 1 representing no signs of ascarids and 4 corresponding to more than three worm sections visualized on the exam. One score was assigned for each foal on a daily basis over the course of 6 months. Data is being analyzed to determine the association between transabdominal ultrasonographic scores and fecal egg count, potential correlation with worm burden, and to evaluate if the scoring system can be used to monitor foals with naturally occurring ascarid infections.

Figure 1. Transabdominal section performed in the ventral midline with several visible worms in longitudinal section with the characteristic double parallel echogenic lines (white circles).
each examination day. Foals were euthanized at ages ranging from 169 to 293 days and full worm counts performed. For the second part of the study, fifteen foals were randomly allocated to three treatment groups; ivermectin, oxibendazole, and no treatment. Blinded ultrasound examinations were performed daily for five consecutive days following treatment. Foals were both ultrasounded twice by the same investigator, and by two different investigators. Two consecutive examinations were found to reliably detect worm burdens larger than ten ascarids. Ascarid scores declined in response to both anthelmintic treatments, although differences were not statistically significant. Kappa values indicated fair to moderate intra- and inter-observer agreements. The ultrasonographic screening techniques can be a useful tool for monitoring ascarid burdens in foals.

184

The perfect tripod for raising healthy horses: simple management, good diagnostic, and a smart team

M.B. Moleto1,2, L.L. Castro1, C.L.H. Abrahão1, J. Antunes3
1 Laboratory of Parasitic Diseases, UFPR, Curitiba, Brazil; 2 INCT Livestock, Brazil; 3 Sao Jose da Serra Stud, Brazil

The objective towards resilient farms is one of the challenges for the future farmer focusing on animal welfare. Parasite infections are responsible for important economic losses in horse farming, either directly in animals that develop clinical signs or indirectly by increasing treatment cost. Cyathostomins (small strongyles) are recognized as one of the main parasitic pathogens of horses and are associated with several clinical and sub-clinical effects in young and adult animals. The objective of this study was to evaluate the body growth and development of horses naturally infected with cyathostomins, including their hematological parameters. The survey was conducted from August 2014 to January 2015 with 30 Thoroughbred horses (21 females and 9 males), eight to 12 months of age and naturally infected with >98% of cyathostomins. The animals belonged to Sao Jose da Serra Stud, in Sao Jose dos Pinhais, Brazil. Animals stayed on pasture (Lolium multiflorum and Paspalum notatum) and received 15 to 30% protein in the diet 2x/day plus hay of Cynodon dactylon depending on age. Weight and height data and stool samples were collected monthly. The faecal egg count (EPG) exam was performed using mini-FLOTAC (x10). All animals were dewormed with ivermectin plus pyrantel in September/2014 as a routine spring-preventive treatment. Individual blood samples were collected every two months (July, September, November and January). The blood samples were performed for leukocyte count and the percentage of packed cell volume. From August to January the weight gain and the monthly growth of the animals was on average 16.6; 28.2; 20.9; 14.0; and 17.3 kg and of 1.9; 1.6; 1.6; and 0.3 cm, respectively. The five-month EPG average was 291.0; 0.0 (IVM+PYR treatment); 635.7; 1230.7; 986.0; and 2064.7. Although the highest monthly weight gain was observed in September, the month in which the animals had zero EPG, did not improve the growth of the foals. There was no correlation (p>0.05) between EPG and body growth during the period. The EPG did not differ between males and females and did not affect their development when evaluated separately. Despite the high EPG, all animals were clinically healthy and the relative leukocyte count was within the reference values for Thoroughbred horses. We found no significant (p>0.05) correlation between EPG and the eosinophil count. Packed cell volume was within the reference values for all months. In the present study, the evaluated hematologic parameters did not change according to EPG, preventing their use as diagnostic markers even for animals with different cyathostomin EPG counts. Although factors like time and money have to be considered, we conclude that foals that are raised under a well-defined set of management practices can have little or no signs of impairment due to worm infections, whilst parasite load was not determine on pasture or in the animals.

160

Anthelmintic resistance in horse nematodes: Where does it come from?

I.J.J. Janssen, M. Kaschny, J. Krücken, J. Demeler, G. von Samson-Himmelstjerna
Institute for Parasitology and Tropical Veterinary Medicine, Freie Universität Berlin, Berlin, Germany

Nematode infections impair health of horses worldwide. Anthelmintic therapy is most often the only way to treat infected animals in order to prevent the onset or further progress of disease. As seen with other chemotherapeutic compounds used for the treatment of parasitic infections, a few years after the introduction of the macrocyclic lactones (ML) a loss of efficacy or even the occurrence of resistance became apparent. Underlying mechanisms of this process are still not completely elucidated, but altered activity of transmembrane efflux pumps like P-glycoproteins (Pgps) are considered a potential mechanism of ML-resistance. Pgps reduce the intracellular accumulation of xenobiotics including drugs by an ATP-dependent transport. This in turn impedes the achievement of effective drug concentrations at the target site as demonstrated for ivermectin (IVM) in mammalian cells earlier. IVM is a ML frequently used for deworming horses e.g. in case of an infection with Parascaris sp. This parasite is found in the small intestine predominantly of young horses where it may lead to intestinal obstructions or rupture of the intestinal wall. Apart from its pathogenicity, high prevalence and worldwide occurrence, Parascaris sp. came into focus as several cases of IVM-resistance became apparent. After identifying two genes coding for Parascaris Pgps (Pgp-11 and Pgp-16), they were analysed regarding morphological and quantitative changes presumably being associated with anthelmintic resistance. By comparing the amino acid sequences of Pgp-11 and Pgp-16 from different Parascaris populations, three amino acid changes within Pgp-11 were found in all investigated populations with decreased ML susceptibility, but were absent in susceptible populations. Furthermore, in a group of worms with reduced IVM susceptibility, a statistically significant overexpression was observed for ppg-11 compared to a randomly selected group. Another evidence for the participation of Pgps in ML resistance was given by their heterologous expression in two model organisms. While the transporter activity of Parascaris Pgp-11 was analysed in the model nematode Caenorhabditis elegans, the impact on ML susceptibility was also investigated for Pgp-9 of another horse nematode (Cyclocoelocycloides elongatus) in a yeast strain lacking endogenous efflux transporters. Both assays were suitable to investigate the impact of Pgps on MLs and vice versa.

203

A field survey to investigate the anthelmintic efficacy against equine strongyles in Romania

Marius Catalin Buzatu1, Ioan Liviu Mitrea1, Eugene Lyons2, Mariana Ionita1
1 University of Agronomical Sciences and Veterinary Medicine of Bucharest, Faculty of Veterinary Medicine, Department of