Evaluating the Effectiveness of the Deworming Protocol at the Kellogg Arabian Horse Center

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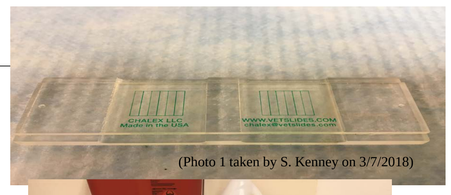
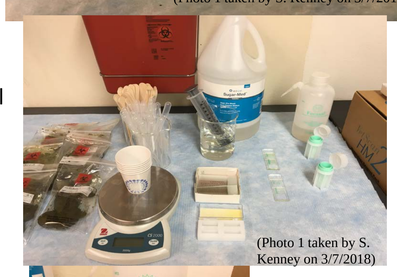
Introduction:
Equine deworming has been an essential practice for maintaining healthy horses for decades. Resistance due to an overabundance of deworming in the past has greatly affected the design behind most equine parasite control programs. The goal in creating a successful deworming protocol is to eliminate the amount of parasite contamination in the environment as systematically as possible, thus minimizing disease risk and future resistance complications. Every farm or property has different influences associated with infective larval growth that will alter the protocol so that it best fits the needs reflected by the horses' health. Anthelminthic administration is the primary method for reducing the worm burden of a horse and is used widely as an essential farm management practice. The strategy for any farm or property manager is to administer the most efficacious anthelminthic drugs in order to reduce the worm burden of a horse. Through proper rotation of the type of medication as well as timing with regards to environmental influences and parasite life cycles, success of a parasite control program can be achieved. Along with deworming treatment environmental control methods should be established to help limit the need for drug administration and contamination levels in the horse's particular living arrangement. The use of a fecal egg count was the basis for this research project. It was used to determine the effectiveness of the current deworming protocol at the Kellogg Arabian Horse Center of Cal Poly Pomona. Through sampling pastured horses, stalled horses, and dry lot horses of all ages, data was compiled together based on age group and environment arrangement. The results were compared to the suggested guidelines for classifying horses into different levels of egg shedding by the AAEP. The timing of deworming and the type of drug administered were taken into account for each FEC conducted. A new approach was designed based on the findings to provide a even more timely and sufficient method for keeping the horses at the Kellogg Arabian Horse Center at healthy minimum levels of parasitic loads.

Methods:
1. Collect fecal sample.
2. Weigh 4 grams of feces in a dixie cup.
3. Add 25 mL of Sheather's® sugar solution to the dixie cup and mix thoroughly with feces.
4. Using a pipette, aspirate the fecal solution and then fill the wells of the McMaster slide.
5. Allow the eggs to rise in the slide for 10 minutes.
6. Meanwhile, use the green vial of the standing fecal floatation device to grind and collect a portion of the fecal sample in the bottom of the vial.
7. Place the green vial with feces back into the clear standing container and add Fecasol® up to the embossed arrow.
8. Twist and turn the green vial so that the feces mixes well with the Fecasol®.
9. Once well mixed, push down on the green vial so that it locks in place within the clear container.
10. Add more Fecasol® to the container until a meniscus forms at the top of the fecal float.
11. Place a cover slip on top of the meniscus and allow the eggs to rise for 10-15 minutes.
12. View the McMaster slide under the microscope and count the eggs present within the gridlines. Record this value.
13. Use the following equation to calculate the egg per gram value: (Eggs counted x 100) /4 = EPG
14. Next, place the cover slip sitting on top of fecal float on a microscope slide and view.



(Photo 1 taken by S. Kenney on 3/7/2018)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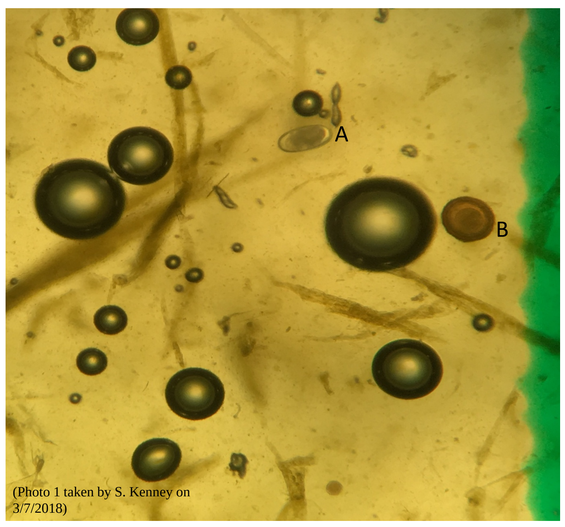
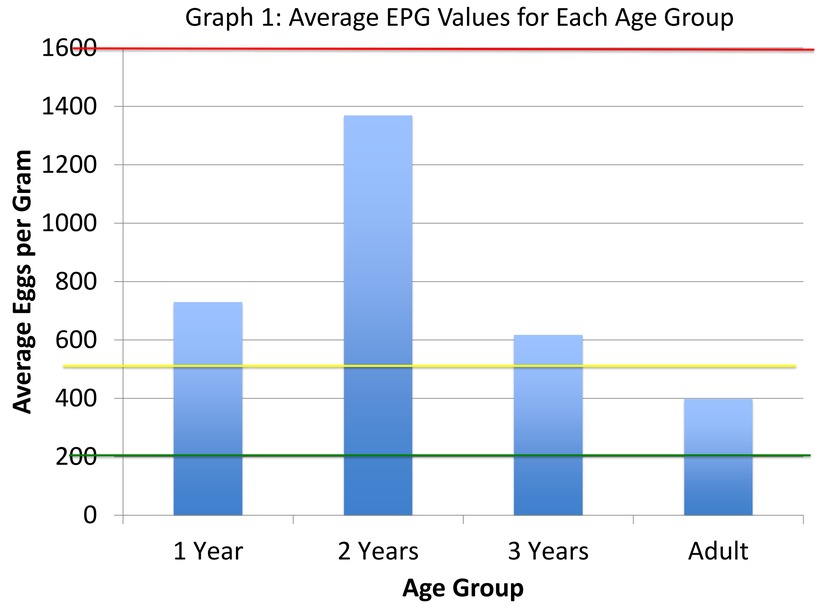


(Photo 1 taken by S. Kenney on 3/7/2018)

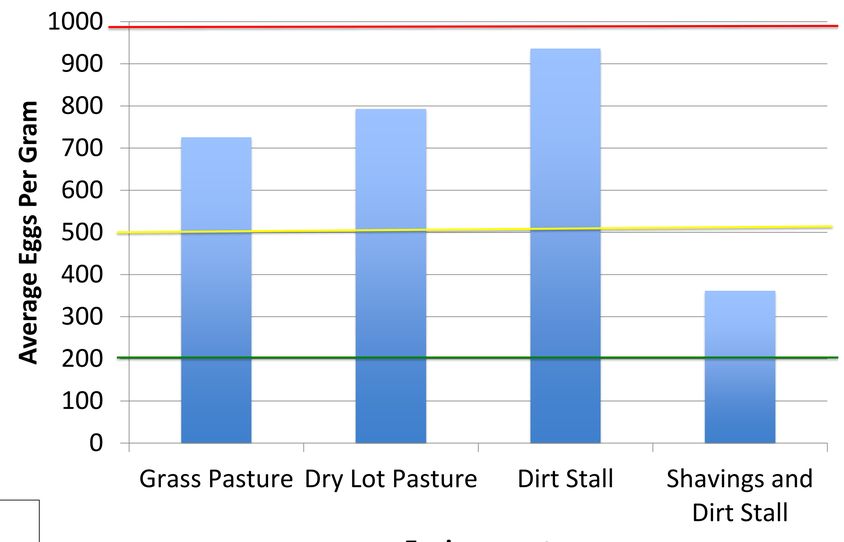
Parasite Overview:
Both large and small strongyles (A) have identical eggs, which are indistinguishable via a microscope (Hendrix, et. al., 2017). In addition, the life cycles of the strongyles are very similar. The eggs are passed in the feces and hatch in the environment. The larvae are the infective stage of this parasite. The larvae will migrate up and down blades of grass until the grazing horse ingests the larvae (Hendrix, et. al., 2017). They are then swallowed and migrate through the intestines until they reach the mesenteric arteries and the liver where they grow and molt to the next larval stage (Hendrix, et. al., 2017). As they grow and molt further they migrate back to the large intestine. Once in the large intestine the larvae then, enter the mucosa of the large intestine and mature to adults (Hendrix, et. al., 2017). *Parascaris equorum* (B) is often called the equine ascarid and are found in the small intestine of young foals (Hendrix, et. al., 2017). Sometimes the foals pass the eggs in their feces and the larvae grow and molt within the eggs. Ascarid eggs are very hardy and sticky and can survive on surfaces as well as extreme environmental conditions (Meierhenry, 2007). The egg is ingested by the foal and hatches in the intestines. The larvae migrate to the liver through the hepatic portal vein, where they grow and molt to the next stage of larvae (Hendrix, et. al., 2017). The larvae are then carried to the lungs through the circulatory system, where they are coughed up and then swallowed. Once they are back in the intestines, the larvae mature into the adults that ingest blood (Hendrix, et. al., 2017).

Results:

Graph 1: Average EPG Values for Each Age Group



Graph 2: Average EPG Values From Individual Horses of Each Environment



Conclusion:
Due to the loss of pastures from construction of Cal Poly Pomona, it has been speculated that egg counts will increase due to the lack of space for proper pasture rotation. With this eminent increased parasite growth, following a parasite control plan is important for the health of the horses at the Horse Center. It is also important to understand that every farm and individual horses residing on the property are different. There are guidelines suggested by the AAEP, Colorodo State University, and the UC Davis Center for Equine Health. However, most parasite control plans are derived based on the specific needs of the farm. Based on the results from this experiment, a suggested treatment plan would include deworming foals starting at 2 months of age and then consecutively every 2 months until they reach 12 months of age. Pregnant mares should be dewormed 4-6 weeks prior to foaling. For brands containing fenbendazole or oxibendazole, egg reappearance can occur in 6 weeks after deworming (Nielson, et. al., 2018). The brand Ivermectin® has an egg reappearance time frame of 9-13 weeks after administration (Nielson, et. al., 2018). Any of these drugs would suffice for pregnant mares, but it would be recommended to re-administer on the day of foaling. For all horses on the farm, a baseline EPG value would be useful for determining exactly what level of contaminator each individual horse falls into. Those that contain >500 EPG should be dewormed up to 3 times a year alternating between drugs. Those that contain 200-500 EPG should be dewormed 2 times a year, again between alternating drugs. Those that fall into the low contaminator region only need to be dewormed once a year simply to maintain their level. These suggestions are based off the results of this experiment and the pre-patent periods per visualized parasite. A pre-patent period is the time from the point of infection by the parasite until the specific diagnostic stage can be recovered (Hendrix, et. al., 2017). Cyathostomins have a pre-patent period of 2-3 months and *Parascaris equorum* have a pre-patent period of 2.5-3 months (Nielson, et. al., 2018). The infective stage of the larval parasites is therefore viable every 3 months if the horse is consistently infected. This does not take into account the temperature exposure every 3 months. The larval parasites survive best in temperature situations of the spring and fall months, when the climate is prime for larvae growth. Optimal temperature for parasite survival in the environment ranges from 50 to 75 degrees Fahrenheit. Anthelmintic treatment during the harsh winter and summer months would be too abundant and could lead to resistance. However, Pomona, California does not experience as harsh a winter as some other locations and that is why high contaminators are recommended to receive 3 anthelmintic administrations a year, roughly every 4 months (winter, spring, and fall). Regardless of the amount of administration per year, the most important aspect of a parasite control is regular fecal egg counts to evaluate potential resistance and whether the drug used has taken effect appropriately. Fecal egg counts should always be done on individual horses based on necessity. However, as a whole the suggested frequency is every 6 months. This is to ensure treatment is successful by evaluating any possible spread of resistance by an increase or decrease in EPG values so that future adjustments can be made for individual horses. Other environmental control strategies should be put in place because anthelmintic use should not be the only method of parasite control as this is how to invoke resistance. Continually removing manure from stalls and pastures is the best way to keep a horse from grazing too close to feces and eliminating the amount of larval contamination. Proper pasture rotation is also a recommended technique to reduce the concentration of parasite contamination in one pasture and allow the already contaminated environment to diminish its egg population. Rotation of pastures should also be correlated with the temperature. Infective strongyle larvae can survive only a few days to a few weeks in hot weather, but as many as six to nine months during colder weather.

Suggested Guidelines for Classifying Horses into Different Levels of Egg Shedding from the AAEP

Low Contaminators	0-200epg
Moderate Contaminators	200-500epg
High Contaminators	>500epg

Deworming Drugs Used at the Kellogg Arabian Horse Center

Photo taken from horsehealthusa.com

Photo taken from fleetfarm.com

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