Gastrointestinal nematode resistance to anthelmintic treatment in Montana and Wyoming sheep flocks: Preliminary results (Year 1 of 2)

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***Overview***

The objective of the study was to provide baseline estimates of gastrointestinal nematode anthelmintic resistance in sheep flocks in Montana and Wyoming, utilizing a larval development assay (LDA, DrenchRite®). Additionally, fecal samples were analyzed and cultured to identify proportion of nematode species present across sheep operations. Sampling occurred on sheep operations grazing on irrigated or sub-irrigated pastures in Montana and Wyoming with a history of internal parasite challenges. Successful execution of the DrenchRite® assay requires fecal samples with a large number of *Haemonchus Contortus* (Barber Pole Worm) larvae (>500 eggs per gram). Composite fecal samples were collected June to August, 2017 from a sub-group of 10 to 15 sheep across operations. Criteria for sheep sampled included the FAMACHA scoring system (3 and 4) which matches the color of the eye membrane to a chart showing 5 color categories that correspond to different levels of anemia (1= not anemic/low parasite burden; 5= severely anemic/high parasite burden).

***Preliminary Results***

Fecal samples were collected at 17 ranches (MT n= 9; WY n=8), 6 ranches sampled had inadequate larvae for the LDA and 5 ranches had adequate larvae present in samples but failed to develop at the laboratory. Consequently, 6 ranches (MT n=4, WY n=2) generated estimates of resistance based off the LDA and figures are provided in Table 1. Percentage of gastrointestinal nematode (GIN) species were generated from 16 ranches and are provided in Table 2.

The predominant GIN species present across sampled ranches was *Haemonchus Contortus* (i.e., Barber Pole Worm) ~65%, followed by *Oesphagostumum*~21%, *Teladorsagia*~19%, *Trichostrongylus* ~11%, and *Cooperia* ~7%. The LDA DrenchRite® was developed for specificity to the *Haemonchus Contortus* spp., and therefore interpretation of results are discussed in the context of anthelmintic efficacy towards this species. By definition, resistance is occurring when anthelmintic treatment fails to reduce GIN larval burden by ≥ 95%. Thus, any anthelmintic product with < 95% efficacy results in GIN populations that are likely genetically resistant to treatment, from which subsequent generations are founded. Degree of resistance (% efficacy) is further classified in Table 1 foot notes.

In short, preliminary results indicate that resistance to Benzimidazoles is occurring on operations in Montana and Wyoming as indicated by high to moderate resistance on samples from 6 ranches. Resistance to Levamisole was comparatively less than that observed in Benzimidazoles, yet none of the 6 ranches sampled showed >95% efficacy. Gastrointestinal nematode resistance to Ivermectin indicates suspected resistance in 3, low resistance in 2, and efficacy in 1 of the 6 ranches. The only anthelmintic indicating 100% efficacy or no resistance is Moxidectin.

Results should be interpreted judiciously as this report represents 6 of the 15 ranches to be sampled for the project. The summer 2018 collection season will provide the needed sample size of 9 additional ranches to provide more accurate findings regarding anthelmintic resistance in the region.

Table 1. Classification of anthelmintic resistance in *Haemonchus Contortus* (Barber Pole Worm) in Montana and Wyoming sheep flocks.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Ranch | Irrigation Type | Benzimidazole | Levamisole | Ivermectin | Moxidection |
| Kalispell, MT | Sub-Irrigated | HR | LR | LR | S |
| Kalispell, MT | Sub-Irrigated | HR | LR | SR | S |
| Whitehall,MT | Irrigated (pivot) | HR | MR | SR | S |
| Malta, MT | Irrigated (flood) | MR | SR | S | S |
| Kaycee, WY | Irrigated (flood) | HR | LR | LR | S |
| Emblem, WY | Irrigated (flood) | HR | LR | SR | S |

1 Benzimidazole Resistance Classification= Susceptible (S) ≥ 95% efficacy, Suspected Resistance (SR) = retesting recommended, Low Resistance (LR) ~80-90% efficacy, Moderate Resistance (MR) ~50-80% efficacy, Full Resistance (FR) ~< 50% efficacy, High Resistance (HR) ~0% efficacy.

2 Levamisole Resistance Classification= Susceptible (S) ≥ 95% efficacy, Suspected Resistance (SR) = retesting recommended, Low Resistance (LR) ~65-85% efficacy, Full Resistance (FR) ~ 52% efficacy, High Resistance (HR) ~0% efficacy.

3 Ivermectin Resistance Classification= Susceptible (S) ≥ 95% efficacy, Suspected Resistance (SR) = retesting recommended, Low Resistance (LR) ~70% efficacy, Full Resistance (FR) ~ ≤50% efficacy, High Resistance (HR) ~0% efficacy.

3 Moxidectin Resistance Classification= Susceptible (S) ≥ 95% efficacy, Suspected Resistance (SR) = retesting recommended, Low Resistance (LR) ~70-90% efficacy, Full Resistance (FR) ~ ≤50% efficacy,

Table 2. Classification of internal parasites present across on 11 ranches in Montana and Wyoming

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Ranch Location** | **Eggs/gram** | **%*Haemonchus Contortus*** | **%*Trichostrongylus*** | **%*Teladorsagia*** | **%*Oesphagostumum*** | **%*Cooperia*** |
| Kalispell, MT | 850 | 80 | 10 | 10 |  |  |
| Kalispell, MT | 1000 | 100 | 0 | 0 |  |  |
| Whitehall, MT | 2000 | 66 | 17 | 4 | 13 |  |
| Malta, MT | 300 | 26 | 1 | 48 | 25 |  |
| Kaycee, WY | 6650 | 88 | 7 | 7 | 2 |  |
| Emblem, MT | 4400 | 83 | 3 |  | 12 | 2 |
| Emblem, MT | 550 | 77 |  | 20 |  | 3 |
| Dillon, MT | 9400 | 100 |  |  |  |  |
| Hall, MT | 800 | 7 | 56 | 3 | 32 | 2 |
| Malta, MT | 950 | 93 | 7 |  |  |  |
| Kaycee, WY | 250 | 42 | 6 | 25 | 25 | 2 |
| Dixon, WY | 150 | 100 |  |  |  |  |
| Bozeman, MT | 100 | 15 | 9 | 41 | 2 | 33 |
| Bozeman, MT | 550 | 2 | 11 | 33 | 54 |  |
| Deaver, WY | 250 | 72 | 2 |  | 26 |  |
| Deaver, WY | 150 | 98 |  |  |  | 2 |
| **Average** | **1772** | **65** | **11** | **19** | **21** | **7** |