We've been doing it all wrong: Working with cattle producers to right the parasite control ship

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Abstract

Anthelmintic resistance in cattle is a growing concern with widespread resistance reported, especially to the avermectin drugs. Treatment of all animals, use of long-acting products, and lack of seasonally strategic plans have all contributed to the problem, along with other factors. Beef cattle veterinarians and producers should come to terms with this reality and start testing for anthelmintic resistance at the level of production groups. Based on individual herd data, holistic and refugia-based parasite control programs should be developed which include considerations of nutrition, climate, strategic selection of animals for treatment, and pasture management.

Key words: beef cattle, *Ostertagia*, *Cooperia*, parasites

What's the Problem and How did we get Here?

Well, we dewormed every single animal twice a year every year, that's how.

Don't believe in parasite resistance? Talk to the goat people.

Beef cattle parasite resistance is a burgeoning area of research due to the increased recognition of resistance on individual farms and ranches. At this time, there are only a couple of completed, published studies, but there is growing data awaiting publication. There is widespread resistance of *Cooperia* sp to the avermectins across the board. In stocker calves in Arkansas, using a fecal egg count reduction test (FECRT), the reduction of fecal egg counts after ivermectin, doramectin, and moxidection were 57.0%, 41.2%, and 91.2%, respectively.[5] The goal is >90% reduction. In a grazing study in the upper midwestern US, *Haemonchus placei* was shown to be resistant to all anthelmintics, and *Cooperia* was resistant to the macrocyclic lactones. Levamisole retained efficacy, but even those animals retained small populations of *Ostertagia*.[2] In a grazing study, yearling heifers in northern California were treated with injectable ivermectin, moxidectin, fenbendazole, and oxfendazole. The white wormers produced a 90% reduction in *Cooperia* epg and moxidectin was 88% effective, while ivermectin produced no adult reduction. Ivermectin was not efficacious against developing or L4 inhibited larvae.[1] Data out of Dr. Kaplan's lab in Georgia indicate that 90% of farms tested through their lab have ivermectin resistance, particularly to *Cooperia* and *Haemonchus*, but also *Ostertagia*. There is substantial data to support this phenomenon from New Zealand, Argentina, Australia and other countries.

Cooperia resistance to the avermectins in calves is well-established and *Ostertagia* resistance evidence is growing. This resistance is of critical concern in permanent pasture situations on the cow-calf side. Many believe that resistance in the parasites of stocker and feedlot calves is of little concern, and therefore little consideration needs to be given to deworming practices in these facets of the beef industry. That may be true while they are in the production unit, but how they come in really matters. What about put-together calves from multiple origins who may be carrying resistant parasites to be shared? How does that impact anthelmintic selection on arrival or during the stocker grazing period? How will that stocker pasture be managed - is it going to be grazed through or harvested?

Several management practices contribute to anthelmintic resistance. Frequent deworming, deworming without regard for parasite biology relative to the climate, deworming all animals and placement on a clean pasture, and the use of long-acting drugs on permanent pastures. Also, recall that not all apparent inefficacy is due to resistance. Improper storage of drugs, expired product, use of generics, and mismatching drug to target parasite may all lead to a failure of parasite reduction, but do not represent inherent parasite resistant to drugs.

Diagnostics

It is imperative that beef cattle herds start to actively evaluate their herds for parasite numbers and characteristics which may be reducing production. The real costs of ineffective parasite control programs are found in reduced milk production, inhibited growth, impaired immunity, and poor feed conversion. These costs are being paid long before the first skinny, rough-coated animal is recognized.

Screening herds for parasite burden and anthelmintic sensitivity is best done using the FECRT. This will not only provide initial parasite quantification, but an *in vivo* sensitivity test for products used. There are several egg quantification procedures available and these must be selected based on the target parasite(s) and overall sensitivity. Where *Haemonchus* or *Cooperia* are the target, a lower sensitivity test like McMasters can be sufficient because these are heavy egg shedders. For *Ostertagia*, *Trichuris* and others, a more sensitive tests such as the Modified Wisconsin or Mini FLOTAC should be

considered. Traditionally, a Modified Wisconsin sugar method was considered standard for cattle over a year of age, while the McMasters was preferred for cattle less than a year. New studies out in the last couple of years show the Mini FLOTAC optimizes egg recovery compared to more traditional methods.[4] At this time, it is a matter of getting reference laboratories on the same page regarding standardization of offerings for livestock fecal examination.

When performing FECRT for herd evaluation, weaned animals that are less than 16 months of age are the best representatives. At least 15 animals per treatment should be sampled, treated, and then have a repeat FEC by the same method on the same animals. If sampling of the same animals is not possible, 30 random-grab samples should be used to evaluate drug effectiveness. Mini FLOTAC or modified Wisconsin are ideally used. The goal is 90% reduction in FEC. The time of the second sample collection for FECRT varies by product class used. Post treatment intervals for fecal sampling are: non-avermectins – 10 to 14 days, avermectins – 14 to 17 days, and moxidectin – 17 to 21 days. If combination treatment is used, 14 days should be observed. Interpretation of FEC has been outlined.[3]

Refugia-based Programs

Refugia is the population of parasites not exposed to anthelmintics. Refugia are beneficial in that they dilute the genetics for resistance in a given population of nematodes. When every animal in a herd is dewormed, especially if then turned out on a clean pasture, refugia populations are greatly diminished and resistant worms are all that remain.

In small ruminants, FAMACHA has been the method used to preserve refugia - you simply don't deworm those animal who aren't anemic. In cattle, however, parasitism is more insidious without a real way to so clearly identify who does and does not need treatment. The source of *Ostertagia* refugia is the adult cows while *Cooperia* refugia is maintained by calves. Two treatment strategies are used in cattle to retain refugia: target selected treatment and selected non-treatment. These are just 2 ways of looking at the same thing. In targeted selected treatment, you are focused on treating susceptible animals, such as those with lower BCS, fluffy hair coat, or are younger. In selected non-treatment, the focus is on animals who do not need treatment, such as older animals, those with the highest BCS in the group, etc. This can also be done randomly - send them through the chute and skip every 10th calf. The target percentage for non-treatment for replacement heifers is 10 to 30% and for calves is 10%. For the adult cow herd, treatment should be based on fecal egg counts (performed seasonally or quarterly) to determine necessity. If treatment is necessary in adults, a strategy is to only deworm those cows that are less than 5 years old, leaving the older, more immune cows to harbor refugia for the group. Bulls, because of their increased susceptibility should be treated at BSE time. Consider the climate. *Ostertagia* is a cool season parasite, while *Haemonchus placei* and *Cooperia* are warm weather parasites. Preserving refugia means not treating in times of low parasite burden.

Of course, when refugia- based strategies are implemented, management must rise to meet the new herd standard. Protein and trace mineral nutrition should be evaluated and holes closed, points of stress should be identified (significant risk factor for rise of *Ostertagia* specifically), and pasture management evaluated. Practices that reduce parasite burdens on pasture include grazing dry cows after calves, grazing other species (if you believe this works, there are papers that prove you are right and if you don't believe in this, there are papers that prove you right), pasture rotation to change the lifecycle of the parasite, so there are no clear-cut rules for this, but certainly do not graze the same production group on the same pasture year after year, and make hay. These strategies can help to create clean/safe pastures and cattle movement should take restoring contaminated pastures into account.

Treatment

It's clear that not every animal should be treated in a group and we have options for how to select those for treatment. When we do elect to treat a portion of the population, what do we need to consider?

Farm-specific FECRT should be guiding our choices of drugs. There are some things that we know to be true. *Cooperia* has almost no susceptibility to ivermectin or eprinomectin, so they are of limited utility in calves; the white wormers do a much better job. The use of long-acting avermectins (especially the very long-lasting preparations) in situations of permanent pastures will eventually kill off refugia. Also, given the high rate of resistance to this class, are they likely to be effective at this particular place? Generic products and pour-ons have limited efficacy and can contribute to anthelmintic resistance. In-feed or block anthelmintics should be avoided. Intake is variable and the animals who most need to be medicated are likely the ones with the lowest intake of feed and, therefore, drug.

An example plan based on a typical spring calving cow-calf cycle; only real modification for fall calving is time of year to deworm pre-weaned calves.

- Spring: FEC on cows to serve as sentinels for calf parasite exposure; treat bulls at BSE; optional fluke treatment*
- Summer: Deworm calves <1m before weaning; no cow treatment because low *Ostertagia*
- Fall: Treat cows <5y; treat replacements (leave 10% untreated); fluke treatment*
- Winter: Monitor nutritional stress, may need additional treatment

*Flukes are refugia killers because all animals must be treated in problem areas. It is standard to treat for flukes in the fall to diminish pasture contamination of

adult flukes that were developing all summer, followed by a spring treatment for an additional kill. An option would be to treat for flukes in the fall, keeping some animals untreated, and then coming up and treating those animals in the spring.

There is growing evidence to support the concept of combination deworming or deworming an animal with 2 (or more) classes of drugs, most commonly a white wormer and an avermectin. Where there is anthelmintic resistance and these classes are both exhibiting fecal egg reduction of less than 90%, their use together becomes additive and can achieve >90% kill. This MUST be used in a refugia-sparing plan. Combination deworming of all animals is just a really handy way to lose efficacy of 2 classes concurrently.

Summary

When working with clients on any herd health problem, I find it useful to make a list of issues for my medical record, but I don't throw that at the owner. It's overwhelming, it looks expensive, and it's a lot to comprehend, especially if it goes totally against traditional thinking. So, they don't do any of it.

Pick maybe 2 things for them to do first and focus them on that. Maybe you start with getting them on a good mineral program and get them to stop using generic pour ons. Then, they start skipping every 10th calf. When they see all the calves don't melt down, they may be more open to hearing you suggest they stop deworming older adult cows. Have them be thinking about their pasture situation. That's potentially expensive and takes planning. Just keep adding until you get them where'd you like them to be or close enough. Every bit helps and after a few years, they are reaping benefits of a couple of manageable projects a year.

For Your Consideration

Deworming everyone and putting them on clean pasture
Babying poor doers; select against parasite susceptibility
Consider worm genetics with the discernment you use for cow genetics
Paying cold hard cash for resistant parasite importation
Accuracy of dosing by eye
Meeting physiological needs to allow cattle to minimize immunologic distractions
Product storage conditions and duration

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Other Suggested Readings

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