What is the real significance of fecal nematode egg counts in cattle?

Fecal exam results can be useful to determine nematode burdens when combined with a complete herd history and an understanding of the numerous variables that affect nematode egg production. Combining all of the facts discussed below, a knowledgeable investigator (veterinarian or parasitologist) is able to give more accurate recommendations to a producer who is developing or examining their deworming program. Fecals exams, without knowledge of the numerous variables involved in nematode egg production, could easily lead to misunderstanding and misinterpretation of results by a producer.

Many factors affect fecal egg counts:

CATTLE: Fecal worm egg counts can be affected by the immune status of the individual animal. In a given herd, on the same pasture, egg counts can vary widely from animal to animal. Stress decreases immunity, so a sick or debilitated animal would be more susceptible to parasite infection and will typically have a higher parasite burden than healthy, less stressed cattle in the herd. Healthy adult cattle generally have a well developed immunity, resulting in lower worm burdens than in young animals with typically less developed immunity.\(^1,2\) There is also variability in infection rates among apparently healthy animals of the same age. To obtain a more accurate measurement of herd infection status, fecal sampling should include individuals in all the various age groups in the herd. The total number tested should account for 10-15% of the herd population. A broader sampling such as this will reduce the effects of individual variability, thus leading to a more precise herd analysis.

INTERNAL PARASITES: The significance of fecal egg counts can be misinterpreted because of the variable egg-laying capacity of different species of worms with similar egg types, maturity of the worm populations, and life cycle variations of the different species. For instance, the three main types of stomach worms in cattle, *Haemonchus contortus* (barber pole worm), *Ostertagia ostertagi* (brown stomach worm), and *Trichostrongylus* species (hairworms), all produce very similar
"strongyle-type" eggs.

Hatching these eggs (fecal culture) and identifying the larvae is the only method for absolute determination of which species are present. In the continental U.S., *Ostertagia ostertagi*, the brown stomach worm, is considered to be the most damaging worm of cattle,(3,4) but the adult worm produces fewer eggs than either of the other two species that produce similar eggs.

Egg production can vary depending upon the developmental phase of the different worm populations present, and the age of the sexually mature worms. Different worm species can have dramatically different maturation rates, altering the prepatent period (discussed below). Younger populations of mature nematodes typically produce more eggs per female. Fertility of the females nematodes decreases as a population ages, leading to fewer eggs produced per adult female.

**Prepatent Period:** Prepatent period, for parasites, refers to the amount of time elapsed from when the infective larvae enters the host until the adult female begins to lay eggs, or produce larvae. The prepatent period can vary greatly among species of parasites. Looking at all of the species of cattle intestinal nematodes, prepatent period can vary from two weeks to over five months. The prepatent period can also vary greatly within a single species of worm, *Ostertagia ostertagi* (the brown stomach worm), due to variations in its life cycle. The brown stomach worm larvae mature for part of their developmental phase in the glands of the stomach (abomasum) in cattle. With type 1 ostertagiasis, the time spent in the glands is brief, resulting in mature worm development in 17-21 days. The brown stomach worm can also go dormant or inhibited (pre-type 2 ostertagiasis) within these glands for extended periods. As many as 90% of *Ostertagia* larvae undergo arrested development and emerge at the appropriate time.(4,5,6) The inhibited stage of pre-type 2 ostertagiasis can last for over five months.

The damaging parasitic disease, type 2 ostertagiasis, occurs before any significant increase in fecal egg production is seen. Interestingly, it is NOT the egg-laying adult brown stomach worms that cause the most severe problems in cattle. Type 2 ostertagiasis occurs when dormant larvae emerge in large numbers from the glands of the stomach damaging the stomach wall, resulting in blood loss, impaired stomach function, and profuse, watery diarrhea. These larvae will develop into egg producing adults about 5 days later.

**PASTURE:** Contamination of the pasture with infective larvae can vary dramatically due to grass cover and moisture conditions. Lush pastures create an environment that will allow infective larvae to survive and be more easily eaten with the forage,(7) leading to increased infection rates and after the prepatent period, higher fecal egg counts.
Conversely, sparse dry pastures will reduce larvae available for infection, but won't necessarily affect survival of larvae on the pasture. Larvae have been found to go underground down to six inches and survive for over a year before reemerging.(8) Therefore, low fecal egg counts don't necessarily mean that a pasture has a low parasite burden.

WEATHER: Weather conditions can affect larval availability,(1,3,5,9) thus indirectly affecting fecal exam results. Dry, hot weather decreases the availability of infective larvae, similar to sparse pasture conditions. In general, with all internal parasites, moist temperate weather increases survivability of infective larvae in the vegetation and induces eggs to hatch. A warm steady rain will change the pasture environment almost immediately, making infective larvae more available on the grass for grazing cattle to ingest. Under conditions such as these, increased fecal egg counts can be expected two to three weeks later.

SEASON: Many parasites exhibit dramatic seasonal variation in egg production. As mentioned previously, the brown stomach worm (*Ostertagia ostertagi*) life cycle can vary dramatically. The inhibited phase of type 2 ostertagiasis typically occurs during the winter in the northern U.S., and during the hot dry summers in the southern U.S.(3,9) During these periods of inhibition, adult worm numbers decrease, resulting in dramatically reduced egg numbers. Considering this seasonal variation, fecal exams performed in mid-winter in Iowa would be of little value in determining the actual infection rate of the brown stomach worm in that herd. Early summer would be a better time to perform fecal evaluations to determine the presence of *Ostertagia ostertagi* with Iowa's climatic conditions. Coastal North Carolina has hot dry summers, and mild, moist winters. In this weather pattern the opposite inhibition pattern occurs, resulting in inhibition of the brown stomach worm during the summer. This demonstrates how brown stomach worm fecal egg counts can vary dramatically due to the location and the season.

PARASITE CONTROL PRODUCTS: Fecal egg counts can be affected by the types of parasite control products and the timing of their use. When considering a particular antiparasitic product, the mechanism of action, duration of activity, and timing of administration will all affect the level of parasite control achieved.(1,9,10,11) thus affecting fecal egg counts. Most parasite control compounds have an extremely limited residual activity, allowing immediate reinfection.(12,13) A newer class of compounds that controls both internal and external parasites has been demonstrated to be long acting against gastrointestinal nematodes.(10,14)

All of the factors previously listed can have an impact on the effectiveness of antiparasitic treatment. Therefore, the timing of fecal sampling becomes a critical factor. Samples should be taken both at or just prior to the time of treatment and 14-21 days after treatment in order to obtain the most accurate information on treatment effectiveness.
TESTING METHODS: The results of fecal testing can vary depending on the test performed and the individual performing the test. Several different techniques are routinely used to perform fecal examinations. It is important that the same test and technique be used when comparing results of sequential tests. The test performed should also be quantitative, to determine the number of eggs per equal unit volume of feces examined. Two tests that allow quantitative analysis are the Modified Wisconsin Double Centrifugation procedure and the McMaster technique. In addition, it is critical that the person performing the test has expertise in both performing the chosen procedure and identifying the eggs or larvae of different worm species.

SUMMARY: A major goal of any antiparasitic treatment program is to effectively control as many species of harmful parasites as possible, with timing that makes the greatest impact. Status of the cattle, pasture, weather and season need to be considered. The parasite life cycles and the effect of larval stages must be evaluated to determine the most effective antiparasitic program. A "standard" antiparasitic program is not always going to be the most effective. One should be able to alter their antiparasitic program to adjust for variations in the weather and pasture conditions.

To utilize fecal egg counts as a tool in determining the proper cattle parasite control program, all of the variables listed above must be analyzed in a professional, unbiased manner. Without knowledge of all these variables, the most an investigator would be able to note is the type of internal parasites present, not the burden in the individual animals tested. Developing the most effective parasite control program depends on a complete professional evaluation of all the critical information affecting parasites and customizing it to the needs and capabilities of the cattle operation.

References


