APRIL 1997

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The Fecal Examination: A Missing Link in Food Animal Practice

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Veterinarians routinely perform fecal examinations for cats and dogs but not for cattle. Why not? Providing food animal clients with up-to-date practical advice that will help them keep their herds healthy and improve the efficiency of their operations is the key to a successful food animal practice. Conducting fecal examinations is a professional value-added service that provides a scientific basis for diagnosis or treatment recommendations. The service separates the veterinarian's advice from a layman's suggestions. The veterinarian can help protect clients' profits and minimize their losses from parasite infections by building a long-term parasite-control strategy. An accurate and simple fecal examination will help accomplish this goal.

Veterinary parasitologists have improved fecal examination technology so that it is now a valuable tool for the food animal practitioner. The fecal examination is useful in predicting the potential of pasture contamination by the animals. The examination can also be used to assess the herds' response to treatment strategies.

Currently, many beef veterinarians use fecal examination techniques that are outdated or that were developed for sheep or small animals. These methods are impractical in bovine practice. In the past, fecal examinations in food animal medicine were conducted only to determine the level of infection in a particular animal. These examinations, which followed outdated techniques, were unreliable. As a result, many food animal practitioners still regard the results obtained from fecal examination to be variable, controversial, and even inaccurate.[1] Many veterinary colleges still teach that fecal examinations are fundamentally useless and of little importance to food animal practitioners.

Many techniques of fecal examination are available to veterinarians. Only three methods (or modifications of the three methods) are commonly used: direct smear, dilution, and flotation.[2] The direct smear has little value to the food animal practitioner because the amount of feces that can be microscopically examined is small in relation to the total amount of feces produced daily by an adult cow. The chance of consistently finding eggs by this method is minimal. The dilution technique suffers from the same disadvantage as the smear technique and is of little value unless the animal is passing a large number of worm eggs. The quantitative McMasters Method[3] is commonly used; but because of the previously mentioned limitations, it is of little use in detection of subclinical infection, especially in adult cattle.

Fecal flotation is the most sensitive method of fecal examination. It is useful in detecting subclinical infections, even when the animals are not passing a large number of worm eggs. The methods and materials used in the various flotation techniques vary. Sodium nitrate, sodium chloride, sodium dichromate, magnesium sulfate, and sugar are all commonly used in flotation solutions. We have found that Sheather's modified Wisconsin sugar flota-

KEY POINTS

- Examination techniques used for feces of small animals or sheep are unreliable for examining bovine feces.
- The modified Wisconsin sugar flotation method of fecal flotation is a professional value-added service that provides a scientific basis for parasite diagnosis and deworming recommendations.
- Fecal flotation can show whether recently acquired cattle require additional deworming.

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Protocol: Modified Wisconsin Sugar Flotation Method

Materials

- Sugar solution (1 lb [454 g] of table sugar mixed with 12 oz [355 ml] of hot water)
- Dispensing bottle with attached 15-ml or larger dosing gun
- Tea strainers
- Taper-bottom test tubes (15 ml)
- Two test-tube racks
- Standard microscope slides
- 22 × 22–mm coverslips
- Two 5 or 3-oz (150- or 90-ml) paper cups (two cups/sample)
- Tongue depressors (one per sample)
- Small syringe (to top off test tubes)

Method

1. Measure 3 g of fecal material (about a thimbleful) into a 3-oz paper cup.
2. Add 15 to 17 ml of sugar solution to the fecal matter.
3. Stir the solution and fecal matter until the material has an even consistency.
4. Pour the mixture through the tea strainer into the 5-oz cup.
5. Use a tongue depressor to press as much material through the strainer as possible.
6. Pour the material from the 5-oz cup into the 15-ml centrifuge tube; centrifuge at 800 to 100 rpm for 5 to 7 minutes.
7. Place the test tube in the rack. Top it off with sugar solution until a meniscus bulges over the top of the tube. Cover the tube with the coverslip and set aside for 2 to 4 minutes.
8. Lift the coverslip straight up and place it on a microscope slide.
9. Scan the entire coverslip to count the eggs.

Advantages of the Modified Wisconsin Sugar Flotation Method

- Requires no specialized equipment and can be conducted in a small area.
- Can be used to examine a large number of samples in a short period.
- Is sensitive enough to detect low egg counts (e.g., from adult beef and dairy cattle and from cattle grazing semiarid range allotments or pastures).
- Is sensitive enough to show the difference in egg shedding associated with various dewormers.
- Is sensitive enough to detect eggs from nonprolific worm species (e.g., *Trichuris* [whipworm] and *Nematodirus* [threadneck worm]).
- Does not distort worm eggs, thus allowing parasite identification through egg morphology.
- Breaks up tapeworm proglottids, thus allowing tapeworm eggs (*Moniezia, Anoplocephala,* and *Taenia*) to float on the sugar solution.
- Is sensitive enough to float coccidia (*Eimeria* and *Isospora*) and *Cryptosporidium.*
- Can be used to float lungworm larvae from fresh rectal fecal samples.
- Does not have to be read immediately—the sugar solution does not crystallize on the prepared slide; slides can be stored in a refrigerator for several days and can be read when it is convenient.

tion technique[4] (see the protocol) is the most sensitive procedure for use in cattle and swine.

Solutions and Methods

Using the wrong technique will lead to erroneous information, an incorrect diagnosis, and a flawed recommendation. This is especially true for cattle harboring a subclinical level of parasites. Even if the fecal examination is negative, the economic performance of the herd can be affected by undetected parasites. Most commercial techniques, fecal kits, and flotation solutions that are currently used were developed for sheep, which have a low fecal output and often have a high worm-egg output. These techniques are inaccurate when used for cattle because most cows have a high fecal output, low worm-egg output, and consequently low worm-egg counts.

The proper technique must be used in order to obtain reliable, accurate results. Todd found that the modified Wisconsin sugar flotation technique yielded positive results for worm eggs for 90% of a group of 275 dairy cows; the sodium nitrate method yielded positive results for only 19% of these cows, and McMaster's technique gave positive results for only 10%.[5]

The modified Wisconsin sugar flotation method is simple, quick, and inexpensive. It detects economically important gastrointestinal and lung parasites in domestic and wild animal species. The technique has been modified for field use from the original double centrifugal Wisconsin sugar flotation method, in which samples are first spun down in water and then the eggs are floated in sugar solution. The major modification was to eliminate the step involving mixing with water. Instead, the samples are mixed directly with the sugar solution.

The modified Wisconsin sugar flotation technique has many advantages (see the box). It has been used on thousands of fecal samples around the world from a multitude of animal species and has been

TABLE ONE

Identification of Worm Eggs

Parasite	*Approximate Length (µm)*	*Characteristics*
Ostertagia (brown stomach worm)	70	Medium-sized, standard strongyle egg; barrel-shaped side-walls; large number of blastomeres nearly fills egg
Haemonchus (barberpole worm)	85	Larger and rounder than *Ostertagia* egg; blastomeres more easily seen than in *Ostertagia*
Trichostrongylus	85	Often shaped like a kidney bean; one side is more rounded than the other; there is usually a lot of clear space within the egg
Cooperia	75–85	Medium-sized egg with parallel sides and numerous blastomeres that are hard to distinguish
Nematodirus (threadneck worm)	200	Large egg; looks like an American football with basketballs inside; two to eight large blastomeres are surrounded by a fluid-filled cavity
Oesophagostomum (nodular worm)	95	Medium-sized to large egg, about twice the size of the *Ostertagia* egg; 16 to 32 blastomeres are easier to see than those of *Haemonchus*
Bunostomum (hookworm)	100	Medium-sized to large egg; four to eight blastomeres; sometimes the walls are thick and rectangular
Strongyloides (threadworm)	65	Small egg with a thin shell containing an L1 larva that can be seen under low power
Trichuris (whipworm)	75	Egg is shaped like an American football and has two protruding polar caps; the shell is double and thick
Capillaria	50	Smaller egg than *Trichuris* with nonprotruding polar plugs at each end of the egg; thick shell
Moniezia (tapeworm)	80 × 80	Quadrangular; somewhat irregular; contains a circular or pear-shaped apparatus at one end
Dictyocaulus (lungworm)	450	Rectal sample of feces needed for positive identification; L1 larva found in feces; flattened head and tail end in blunt point

Data from Thienport D, Rochette EF, Vanparijs OFJ: *Diagnosing by Coprological Examination*. Titusville, NJ, Janssen Pharmaceutica, 1974.

shown to be one of the most effective fecal flotation techniques. It has been shown to float eggs when other techniques yield negative results.

Sample Collection

Use fresh or refrigerated fecal samples. Heat causes worm eggs to develop and hatch, and freezing can destroy worm eggs. If samples are going to be in a vehicle for more than several hours, a cooler with freezer packs should be used. Take small, individual samples. Each sample should be no larger than a teaspoonful (5 ml). Collect samples in a glove or plastic bag that can be tied or sealed shut (e.g., plastic bags with a zip closure). If plastic bags are used, invert the bag over your hand to pull the sample into the bag.

Label samples carefully with animal name or number, if possible. If samples were taken at random, record the animal groups or pastures from which the samples were taken. Take a sufficient number of samples from each operation to provide an accurate parasite profile of the operation. At least 8 to 10 samples per 100 cows are needed. Sample all categories of animals in a herd (e.g., for a cow/calf operation, take samples from cows, bulls, yearlings, replacement heifers, and calves).

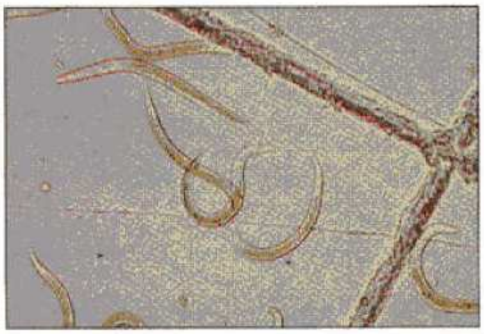
Accurate fecal examinations allow the veterinary advisor to provide a scientific approach to help producers make decisions about their deworming strategies. The fecal examination gives the veterinarian definite information on the level of worm-egg shedding as well as on the general types of parasites present in each category of animal examined. The level of worm-egg shedding indicates the parasite prevalence and determines the potential for future infection of the grazing animals. When combined with knowledge of the epidemiology of gastroin-

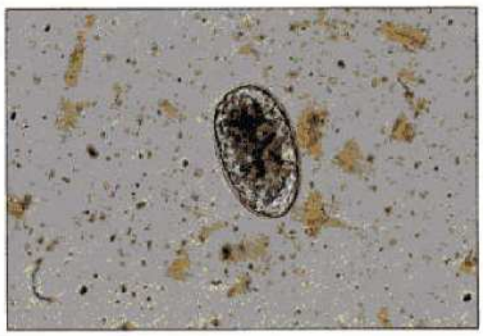
Color Atlas of Worm Eggs


Bunostomum (hookworm)


Capillaria


Cooperia


Dictyocaulus (lungworm)[a]

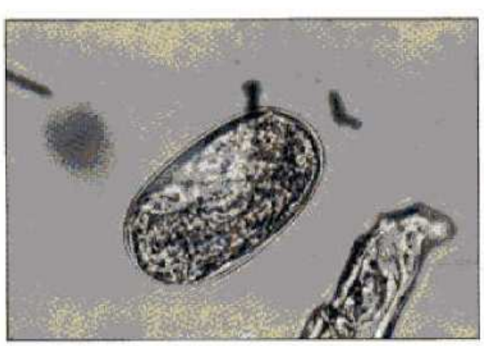

Haemonchus (barberpole worm)


Moniezia (tapeworm)

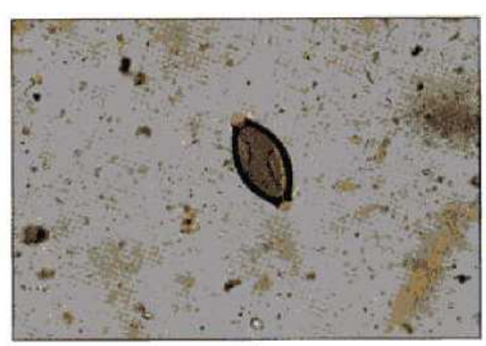

Nematodirus (threadneck worm)


Oesophagostomum (nodular worm)


Ostertagia (brown stomach worm)


Strongyloides (threadworm)


Trichostrongylus


Trichuris (whipworm)

[a]From Eysker M: *Dictyocaulosis* in cattle. *Compend Contin Educ Pract Vet* 16(5):671, 1994.

Parasite Evaluation Reporting Form

Date ____________________ Sheet number ____________________

Sponsoring Clinic ____

Clinic phone number ____________________ Location ____________________

Veterinarian ____

Client ____________________ Address ____________________

Phone ____________________ Location ____________________

Type of livestock ____

Grazing history ____

Treatment history ____

SAMPLE #									
IDENTIFICATION									
Haemonchus/Tricho.									
Ostertagia									
Cooperia									
Nematodirus									
Oesophagostomum									
Trichuris									
Hookworm									
Total Count									
Tapeworm									
Coccidia									

Comments:

TOTAL × 150 = Eggs/lb of fecal material ____________________

+	=	0 to 10 eggs
++	=	11 to 50 eggs
+++	=	50 or more eggs

Signature ____________________

testinal parasitism under local conditions and knowledge of the client's management practices, the fecal examination results give the veterinarian the necessary tools to design a parasite-control strategy.

Marketing a Fecal-Examination Service

The veterinarian can play an important role in advising the client on a cost-effective parasite-control strategy. Each class of livestock within an operation needs a specially designed control program. In addition to knowing local conditions and weather patterns, the veterinary practitioner should be familiar with each operation—its livestock and its parasite problems—before providing a customized program. Fecal checks are vital to this process.

Providing regularly scheduled fecal examinations for each enterprise ties the client to the clinic for key information about the operation. It facilitates assessment of all aspects of the client's production-medicine program—in conjunction with the deworming program.

Keeping records on fecal examinations can be helpful in monitoring parasite-control strategies. If, for example, a particular operation has fecal examinations conducted on cattle in the autumn, comparing fecal-examination results with those from the previous autumn can help the veterinarian evaluate whether deworming strategies are working. Checking stool samples of purchased cattle or other incoming cattle will tell the producer whether the cattle need to be dewormed on arrival. The fecal check can be used to determine whether the current dewormer or deworming strategy is effective.

Feedlot production-medicine advisors could save feedlots thousands of dollars by checking incoming cattle for parasites. Over the past few years, deworming has become an important part of production-medicine programs for range cattle in the United States. Because of this increased emphasis on deworming, most animals coming into feedyards have been dewormed numerous times. The animal's deworming history is usually difficult to find, so an accurate fecal examination can be valuable for determining whether additional deworming is needed. Newly arrived cattle can be examined during the first processing period.

Whether the producer purchases dewormers at the clinic may not be as important as the overall service provided through the fecal check. Some veterinarians will provide the fecal examination at no charge or at a reduced rate if the producer buys deworming supplies at the clinic. If a producer buys deworming supplies elsewhere, a fee is charged to cover the cost of the professional advice dispensed.

Parasite Identification

Worm-egg identification charts are not readily available. Table I and the Color Atlas of Worm Eggs can be used as a general guide to distinguish one egg type from another. Identifying specific parasite types (e.g., tapeworms, *Nematodirus*, or *Ostertagia*) can greatly improve treatment recommendations and the development of an overall treatment strategy.

Recording Forms

Recording the results of fecal examinations is important. These reports (see Parasite Evaluation Reporting Form) can be used to determine deworming strategy or to monitor progress in parasite control.

Other Diagnostic Techniques

Several techniques for diagnosing parasitism now have simplified procedures that most veterinarians can conduct in their own clinics. These are the modified Baermann test for lungworms, the modified Wisconsin sugar flotation for coccidia and *Cryptosporidium*, a direct smear for *Giardia*, and the FLUKEFINDER® (Visual Difference, Moscow, ID) for detection of liver fluke eggs.

Summary

The survival of the cattle industry depends on the survival of individual producers. In many cases, the survival of individual producers depends on whether these producers can acquire and assimilate new technology that will improve their efficiency. Large animal veterinarians, because of their education and their position in the community, can often play an important role in this process of technology transfer. To do this, the veterinarian must continue to stay abreast of new technology and monitor the changes in the industry.

Producers must understand that the control of gastrointestinal and lung parasites is important to the efficiency of an operation. Parasites cause disease, interfere with feed utilization, retard growth in young animals, lower body condition, reduce breeding efficiency, and diminish milk production. The livestock producer is also affected by the indirect effects of parasites. These involve deworming labor costs, the cost of the dewormer, and the cost of diminished performance associated with the stress animals undergo during handling. Subclinical parasitism also influences the general health of the herd by exacerbating the effects of other disease organisms they may harbor.

Strategic deworming programs should be based on accurate diagnosis and an understanding of the epizootiology of internal parasitism.[6] The diagnostic technology is available. Veterinarians who are equipped to use this technology to diagnose and monitor parasite problems can provide a cost-effective and efficient parasite-control program for their food animal clients.

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