Diagnostic update

Fecal Dx antigen testing—find parasite infections the microscope misses

Introduction

To ensure the health of patients, a fecal examination for intestinal parasites is an important part of a wellness visit. Traditionally, detection of intestinal parasites has relied primarily on fecal flotation methods. Regardless of the fecal procedure used, there can be some limitations on accurately identifying infections with some parasites. To improve detection of the most common parasites, antigens for hookworms, roundworms, whipworms, *Giardia, Cystoisospora*, and flea tapeworms allow for accurate detection of the most clinically relevant infections. Fecal Dx[®] antigen testing can serve as a highly accurate and effective screening method for intestinal parasitism.

Background

In small-animal practice, hookworms, roundworms, whipworms, *Giardia, Cystoisospora*, and flea tapeworms are commonly encountered intestinal parasites of canine and feline patients. They each have a unique life cycle, and their prepatent period, the time in which they infect a host before laying eggs, may range from 14–21 days in hookworms, 14–30 days in roundworms, 14–35 days in flea tapeworms, to as long as 74–90 days in whipworms.¹⁻⁵ This prepatent period may allow infections to go undetected on fecal flotation, increasing the chance for the appearance of clinical signs prior to evidence of eggs or proglottids in the stool. *Giardia* and *Cystoisospora* have much shorter prepatent periods and reinfection due to environmental contamination can be commonly seen.^{6,7}

Prevalence

In dogs and cats, the prevalence of infection with each intestinal parasite varies from region to region and tends to occur more frequently in shelter animals than in well-cared-for dogs and cats that visit the veterinarian on a regular basis. Outdoor pets and those that consume prey with possible infective larvae in their tissues may be more likely to be infected. Intestinal parasites were found in 20% of dogs and 85% of dog parks across the United States.⁸

Studies have shown that hookworm and roundworm prevalence in pet dogs was 4.1% and 2.5%, respectively,⁹ and 20.2% and 15.2% in shelter dogs.¹⁰ One study on feline fecal specimens found that 6.2% of the cats were positive for roundworms.¹¹ The whipworm prevalence in dogs in the U.S. ranges from 1.1% in pet dogs⁹ to 14.3% in shelter dogs.¹⁰ *Cystoisospora* prevalence is 8% in specimens from patients less than 1 year of age and 2.7% overall.¹² Tapeworm positivity detected by fecal flotation ranges from 0.2% for dogs and 0.9% in cats.^{9,11} *Giardia* can be found in up 12.2% of canine specimens⁹ and 6.5% of feline specimens.¹¹

Clinical signs

Some dogs and cats infected with these common intestinal parasites may show no clinical signs, but others may develop a

variety of gastrointestinal signs that depend on the parasite and age of the patient. Signs may range from mild diarrhea, vomiting, and ill thrift to severe bloody diarrhea, anemia, and occasionally death.¹⁻³ Healthy adult dogs and cats may be infected with *Cystoisospora* and show no clinical signs. Clinical signs are more likely in young, immunocompromised, and/or stressed patients, including diarrhea, weight loss, dehydration, hemorrhage, vomiting, depression, and anorexia.¹³ While *Giardia* is commonly detected in fecal specimens, many infections don't result in clinical signs. *Giardia* may cause acute, chronic, or intermittent diarrhea, particularly in young dogs and cats.¹⁴ Dogs and cats with flea tapeworm infections rarely develop any clinical signs.⁴

Current diagnostics

The most common method for diagnosing intestinal parasite infections is fecal flotation, either passive or by centrifugation. There are many issues that may complicate the diagnosis of infections with this method. One possible complication is misidentification. Pollen and other debris may be misidentified as eggs. In addition, the inappropriate identification of eggs from other species because of coprophagy (the ingestion of infected feces) may also occur. One study found that 31.5% of *Toxocara*-positive canine fecal specimens were, in fact, *Toxocara cati* eggs.¹⁵

Another common problem is the varying density of the different species of eggs, which makes it difficult to select the ideal fecal flotation solution to ensure adequate recovery of eggs from all potential parasites. Another challenge with fecal flotation is that identification of eggs lacks the ability to detect infections during the prepatent period or with single-sex infections, when eggs are simply not yet present in the fecal specimen. Finally, fecal flotation may not always be reliable as a single test. Because some parasites shed eggs intermittently, a specimen from an infected animal may still generate a false-negative diagnosis if only a single fecal flotation is examined. For all these reasons, there is a need for better tools for the diagnosis of the most common intestinal parasites found in dogs and cats.

Testing innovations from IDEXX Reference Laboratories

Antigen detection has been commonly used to diagnose heartworms and *Giardia* infections for many years. IDEXX Reference Laboratories has developed Fecal Dx antigen testing for the detection of hookworm, roundworm, whipworm, *Cystoisospora*, and flea tapeworm antigens in feces. This method detects proteins (coproantigen) secreted or excreted by parasites into the intestinal lumen. For nematodes, antigens are secreted by the adult worm and are not present in their eggs, which allows for detection of prepatent stages as well as the ability to overcome the challenges of intermittent egg shedding. Early detection



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during the prepatent period will also reduce the frequency of environmental contamination with potentially infectious eggs.

CAPC fecal testing recommendations

Companion Animal Parasite Council (CAPC) recommends fecal examinations at least four times during the first year of life, and at least two times per year in adults, depending on patient health and lifestyle factors, and suggests advanced technologies, such as fecal antigen, may be preferred for parasite detection.¹⁶ Fecal tests for antigen should be combined with microscopic examination of feces for eggs for the widest breadth of detection of intestinal parasites in dogs and cats.^{1–4}

Detect more infections

IDEXX Reference Laboratories testing on over 1.6 million canine and 95,800 feline fecal results were analyzed for positive nematode results. These specimens were submitted for testing using both fecal flotation by centrifugation (fecal 0&P) and fecal antigen for hookworm, roundworm, and whipworm.^{9,11}

Hookworm eggs were detected in 2.2% of the canine specimens. The hookworm antigen was positive in 3.5% of specimens. Total hookworm detection with the combined fecal O&P and antigen testing was 4.1%.⁹ For feline specimens, hookworm eggs were detected in 0.5% of the specimens, while the hookworm antigen was positive in 0.9% of specimens. Total hookworm detection with the combined fecal O&P and antigen testing was 1.1%.¹¹

Roundworm (ascarid) eggs were detected in 1.9% of the specimens. The roundworm antigen was positive in an additional 2.1% specimens, thus bringing the total roundworm detection with the combined fecal O&P and antigen testing to 2.5%.⁹ For feline specimens, roundworm eggs were found in 4.6% of specimens while 6.2% were positive for the roundworm antigen. Total roundworm detection with the combined fecal O&P and antigen testing was 6.7%.¹¹

Whipworm eggs were detected in 0.6% of the canine specimens. The whipworm antigen was positive in an additional 0.8% of specimens, bringing the total whipworm detection with the combined fecal 0&P and antigen testing to 1.1%. Whipworms are rarely found by either method in feline specimens.¹¹

In a study of 589 pet dogs, flea tapeworm antigen was detected in 2.2% of specimens, while none were found by fecal O&P.¹⁸ Studies have previously demonstrated that perianal swab PCR can detect *Dipylidium caninum* (flea tapeworm) in feces from experimentally infected and field dogs.⁵ In a study using experimentally infected dogs, 88% of the specimens that were perianal swab PCR positive were also positive for flea tapeworm antigen.¹⁷ In a field study of dogs infested with fleas, positive and negative agreement between *D. caninum* perianal swab PCR and antigen detection was 77% and 97%, respectively.¹⁷

In 86,836 fecal specimens submitted to IDEXX Reference Laboratories, 2.7% were positive for antigen, while only 1.0% were positive for *Cystoisospora* oocysts by fecal O&P. We see more than 8.0% positivity in dogs and cats less than 6 months of age, with positive results much less common in older pets.¹²

Utility of antigen testing for screening

When fecal diagnostics are performed as part a preventive healthcare program on patients without clinical signs, antigen testing can serve as a highly accurate and effective screening method for intestinal parasitism. Fecal antigen has an increased level of parasite detection over fecal O&P alone and the fecal O&P results rarely alter the treatment or management of the patient unless clinical signs are observed. A study found that Fecal Dx antigen finds an additional 9.2% more positive specimens than fecal O&P alone. Only 0.8% of all screening fecal exam findings are antigen negative and would have clinically relevant fecal O&P finding that could indicate a different treatment need. Overall, fecal antigen finds up to 2 times more than fecal O&P alone.¹⁹



Detect infections earlier

Because fecal O&P testing can't detect eggs during the prepatent period, many parasite infections may go undetected and, therefore, create a difficulty in correlating clinical signs to fecal test results. In an experimental infection study conducted at IDEXX, fecal antigen was able to detect infection during this prepatent stage.¹⁹

The graph below illustrates the identification of a whipworm infection approximately 30 days before fecal O&P testing when using the whipworm antigen.

Prepatent infection detection





Treatment

There are a variety of anthelmintic products available for both treatment and control of intestinal parasite infections. Please see the current Companion Animal Parasite Council (CAPC) recommendations for guidance¹⁶ at www.capcvet.org.

Fecal Dx[®] antigen testing detects proteins secreted or excreted by parasites into the intestinal lumen. A positive antigen test indicates infection. Antigen-positive and egg-negative specimens can be seen during the prepatent period, in single-sex infections, and due to intermittent egg shedding. Microscopic identification of eggs in antigen-negative specimens may be due to coprophagy or because the amount of antigen is below the level of detection. Treatment should be considered for patients found positive by antigen, egg, or proglottid observation. For *Giardia* and *Cystoisospora* positive results, treatment is recommended when clinical signs are present.^{6,7}

Public health considerations and preventive measures

Because of the zoonotic potential of these parasites, most commonly hookworm and roundworm, immediate disposal of feces is important. This will also reduce the likelihood of reinfections and prevent the long-term contamination of the environment. Monthly anthelmintic medications can be helpful in preventing reinfections and reduce environmental contamination.

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