SPIN CYCLE
The Companion Animal Parasite Council recommends fecal examination for adult dogs and cats at least twice per year.

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CLINICAL PATHOLOGY

The Veterinary Nurse's Guide to Fecal Flotation Techniques

MEET THE AUTHOR

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Fecal examination is an important part of a complete physical examination, and fecal flotation is the most common in-clinic technique used. Fecal flotation is mostly used to identify helminth eggs (e.g., roundworms, hookworms, whipworms), protozoal cysts/oocysts/trophozoites (e.g., *Giardia*, *Toxoplasma*, coccidia), and skin mites (e.g., *Demodex*, *Cheyletiella*).

As more owners take their pets to dog parks, day care facilities, and boarding facilities, the need for complete fecal examination increases. A 2020 study determined that approximately 20% of dogs visiting dog parks are infected with at least 1 intestinal parasite, and 85% of dog parks studied were contaminated with intestinal parasites.[1] Continual environmental contamination poses a real risk. An environment contaminated with parasite eggs is difficult to clean and return to an uncontaminated state. Early detection and treatment of parasite infections potentially reduce environmental contamination and other animal infections.

The Companion Animal Parasite Council (CAPC) recommends performing fecal examinations 2 to 4 times annually, depending on the age of the dog or cat.[2] Diagnosing and treating parasitism help prevent transmitting infection to other pets, help limit the spread of zoonotic disease, and improve overall animal health. There are many ways to examine a fecal sample; this article focuses on the most common and more accurate techniques of fecal flotation.

FECAL SAMPLES

Fecal samples should consist of at least 3 to 5 grams of feces in a clean container (**FIGURE 1**). Acceptable containers include, but are not limited to, an unused sandwich bag, a clean small plastic container, a laboratory-provided sample cup, an examination glove, or common fecal pickup bags. All samples should be labeled with client and patient names, date of sample collection, time of sample collection (depending on suspected parasite and sample storage), age of patient, and any other clinic-specific required information (**FIGURE 2**).

Ideally, the fecal sample should be fresh (<2 hours old) at the time of examination. Freshly collected samples are less likely to be contaminated with free-living nematodes or pseudoparasites. In fresh samples, the outer membranes of parasite eggs remain intact and the eggs are more likely to be accurately identified. If unable to examine a sample while fresh, store it at 4°C/39°F in the refrigerator.[3] Proper refrigeration will keep most parasite eggs viable for up to 2 months. Samples can be stored indefinitely by adding 10% formalin. However, if not mixed quickly and evenly, formalin can damage some protozoan trophozoites, thereby leading to misdiagnosis by flotation as well as interference with polymerase chain reaction testing.[4]

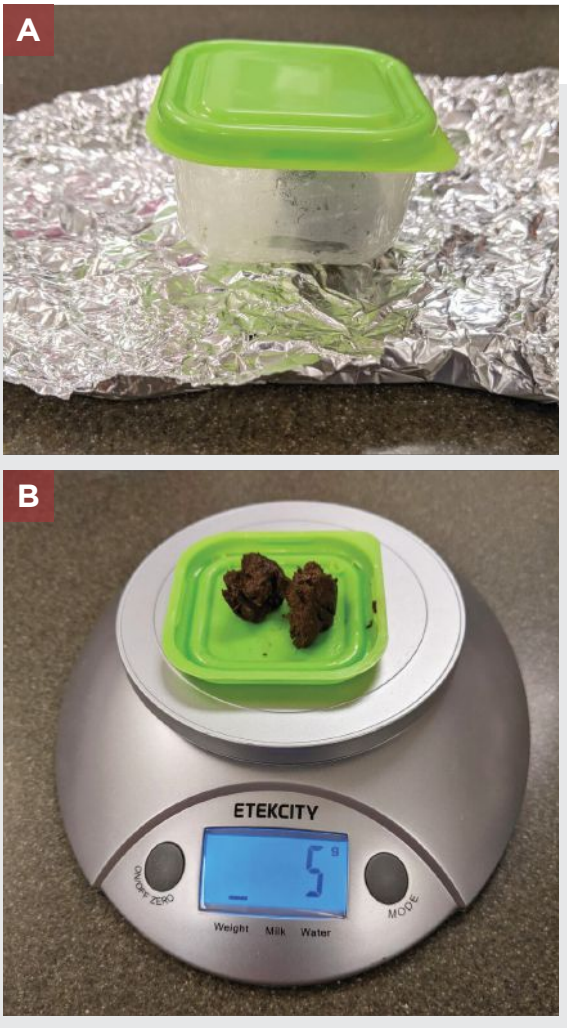

FIGURE 1. Fecal sample **(A)** in clean plastic container and **(B)** on a scale, showing proper amount.

SAMPLE HANDLING

Some parasite eggs can infect humans (i.e., are zoonotic); therefore, wearing appropriate personal protective equipment (i.e., gloves and goggles) when handling fecal samples is recommended. To avoid contamination, surface areas should be sanitized before and after preparing fecal samples for examination. When performing batches of samples, there should be sufficient space between samples to avoid their contaminating each other. To avoid misidentification, fecal specimens should be labeled during preparation when moving from primary containers to secondary containers or devices, including microscope slides.

FLOTATION SOLUTIONS

Many chemical solutions are used for fecal flotation, primarily sugar or salt solutions such as zinc sulfate or sodium nitrate, both of which provide the proper specific gravity so most parasite eggs float to the top and fecal debris stays at the bottom. The range of specific gravity varies because solutions of lower specific gravity are good for retrieval of some eggs and solutions of higher specific gravity are better for others. Appropriate specific gravity also helps keep parasitic

FIGURE 2. Well-spaced and labeled fecal samples in various containers on a clean surface.

eggs or protozoan cycts/oocysts intact. To confirm that the chemical solution specific gravity is in the acceptable range for your purposes, it should be checked often, ideally every time you perform fecal flotations. Many laboratory manuals recommend that specific gravity for fecal flotation solutions be 1.2 to 1.3.[3]

TYPES OF FLOTATION EXAMINATION

The most common forms of fecal examination are passive flotation and centrifugation. The main difference is the mode of separating the fecal debris from the parasite eggs.

Passive Flotation

Passive fecal flotation is the least complicated flotation technique. Many disposable and economically priced kits are available. Compared with the centrifugal technique, the number of steps is minimal and less equipment is required. However, passive flotation is not as reliable as the centrifugal technique because given the limited filtering done by disposable kits, the fecal debris may cover up eggs in the sample.

For passive flotation, a small part of the fecal sample is placed into the disposable kit container. The chosen chemical solution is then added, and the sample is broken down by macerating it gently. After the fecal matter is thoroughly mixed, additional chemical solution is added to further dilute the sample. The container should be filled enough to produce a rounded meniscus (**FIGURE 3B**), on which a coverslip is placed; care should be taken not to spill any of the sample. As stated earlier, provide enough space between mixed samples to avoid contamination. The sample should then be left undisturbed with the coverslip in place for 15 to 20 minutes, which allows time for the fecal debris to sink to the bottom and the eggs to float to the top. After that time interval has elapsed, the coverslip can be removed and placed on a microscope slide; this should be done carefully because the eggs are lightly adhered to the coverslip. The prepared slide is then ready for examination under the microscope.

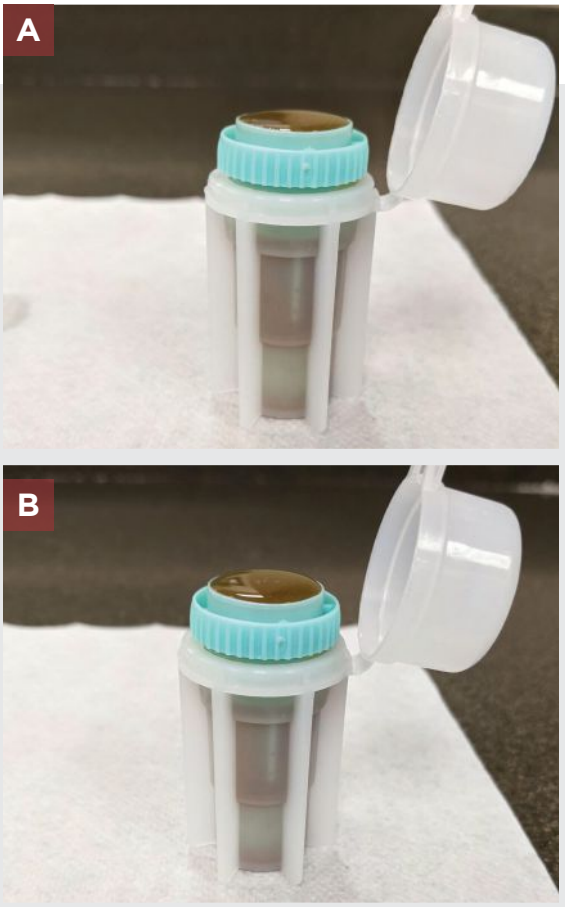

FIGURE 3. Samples in passive fecal flotation container showing **(A)** inadequate meniscus and **(B)** proper meniscus.

Centrifugal Flotation

Centrifugation is the most recommended flotation technique. It is widely used in clinical settings and at reference laboratories.[5] This technique reliably enables identification of parasite eggs from common domestic animals and is recommended by the CAPC. Centrifugation requires more equipment than passive

FIGURE 4. Fecal samples before centrifugation: **(labeled A)** inadequate mixing, and **(labeled B)** proper mixing so that parasite eggs will come to the top and fecal debris will remain at the bottom.

BOX 1

Advantages and Disadvantages of Fecal Flotation

Advantages

- Properly performed in the clinic setting, fecal flotation provides a fast result.
- The solutions used for flotation are commercially available and easily maintained.
- Specific gravity of 1.2 to 1.3 is easily checked and maintained with a hydrometer.
- Equipment can be easily obtained and maintained for accurate results.

Disadvantages

- Contaminants from the environment, such as pollen, grass, and organic debris, can be misidentified as parasite eggs.
- Detecting current infections can be challenging because of the different parasite prepatent periods, single-sex parasite infections, and egg-shedding variability.
- Coprophagy may lead to misidentification of eggs that were in the feces of another species but are not infectious for the canine or feline patient.
- Variations in egg density may prevent parasite eggs from floating to the surface and attaching to the coverslip, thereby limiting their detection by any form of fecal flotation.[3]

flotation, including a free arm swinging centrifuge; however, the same chemical solutions can be used.

For centrifugal flotation, the sample is placed in a centrifuge tube with a small amount of chemical solution and is gently macerated and mixed (**FIGURE 4**). The tube is then placed into the centrifuge and diluted with additional chemical solution until a slightly rounded meniscus is achieved, after which a coverslip is placed so it seals well with the tube. If a batch of multiple samples is not being examined, this tube needs to be balanced to ensure proper rotation; improper balance may damage the centrifuge. Balancing involves using the same type of tube and same type of solution; water is not the best choice because it is lighter than flotation solutions. The sample with coverslip is then centrifuged for 3 to 5 minutes at 1000 to 1500 revolutions per minute, after which the coverslip is moved onto the microscope slide and examined. This technique shortens the time needed to get the parasite eggs to come to the top and the fecal debris to stay at the bottom. It also increases the yield of parasite ova within the sample, thereby increasing the procedure's sensitivity.

ANTIGEN TESTING

Although this article is about fecal flotation techniques, combining flotation with antigen testing can minimize some of the disadvantages of flotation alone (**BOX 1**). Antigen tests can detect infections earlier than fecal flotation because they can detect parasites during the prepatent periods, before parasite eggs are present. These enzyme-linked immunosorbent assays detect parasite antigens and identify secretions from adult worms that have not yet released parasite eggs. The CAPC recommends using antigen testing in combination with centrifugal flotation to avoid some of the disadvantages of flotation, to identify common domestic animal parasitic infections earlier, and to differentiate parasite eggs from contaminants.[3]

CLIENT COMMUNICATION TIPS

When recommending fecal flotation, several published materials can help you educate clients about the importance of fecal examinations, including CAPC guidelines and veterinary websites, such as Veterinary Partner (**veterinarypartner.vin.com**) and Life Learn Animal Health (**lifelearn.com**).

- Compare the ease and relatively low cost of routine fecal testing to detect parasitism early with potential costs of treating advanced parasitism later.
- Describe why fecal testing, diagnosis, and treatment (if needed) are beneficial to pets' health.
- Explain the personal benefits to clients (minimizing zoonotic disease) of diagnosing and treating parasitism in their pets.
- Emphasize the animal and public health value of minimizing parasite burdens in dog parks and other community environments.
- Inform clients that a result of "no parasites seen" does not necessarily mean that their pet is not infected. It means only that eggs were not being passed at that time (e.g., prepatent period) or were not detected (e.g., problem with sample collection, handling, storage, or processing). TVN

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