IDEXX LABORATORIES

DIAGNOSTIC UPDATE

IDEXX Reference Laboratories • January 2009

IDEXX Canine and Feline Diarrhea RealPCR™ Panels from IDEXX Reference Laboratories

Background

Diarrhea is a common problem in companion animals. Identifying infectious causes of diarrhea is an important component of the diagnostic workup, but it is often overlooked. Performing fecal ova and parasite screens and supplementary *Giardia* testing is fairly routine, but rarely are additional diagnostic tests performed to identify infectious causes of diarrhea. This may in part be because traditional methods for identifying gastrointestinal infections have been expensive, of low diagnostic sensitivity and slow to yield results. It is common for dogs and cats to be treated with broad spectrum anthelmintic and antibiotic therapies. If diarrhea persists, infectious causes are considered unlikely and dietary trials and symptomatic treatment is often pursued. If this approach is unsuccessful, intestinal biopsies may be obtained in some cases in an attempt to yield a definitive diagnosis that may lend itself to specific treatment.

Treatment failure with persistent or recurrent diarrhea, lack of a definitive diagnosis and expense of ineffective medications can lead to client dissatisfaction and noncompliance as well as jeopardize the pet's health.

IDEXX Diarrhea RealPCR Panels

The IDEXX diarrhea RealPCR panels allow you to screen for multiple infectious causes of diarrhea from a single fecal sample. These panels offer a comprehensive tool to identify common intestinal pathogens to help you more quickly and accurately identify the infectious agents that may be contributing to diarrhea in your patients.

The panels are specifically designed for dogs and cats, and they detect the most likely infectious causes of diarrhea in each species. These diarrhea panels can be used to complement your routine fecal tests (e.g., fecal ova and parasite screen and SNAP® *Giardia* Test in dogs and cats with diarrhea). The diarrhea panels are not intended to be used as a screening tool in healthy pets except in a shelter-type environment for surveillance.

The canine diarrhea panel includes RealPCR tests for *Giardia* spp., *Cryptosporidium* spp., *Salmonella* spp., *Clostridium perfringens* enterotoxin A gene, canine enteric coronavirus, canine parvovirus 2 and canine distemper virus.

The feline diarrhea panel includes RealPCR tests for *Tritrichomonas foetus, Giardia* spp., *Cryptosporidium* spp., *Toxoplasma gondii*, *Salmonella* spp., *Clostridium perfringens* enterotoxin A gene, feline coronavirus (FeCoV) and feline panleukopenia virus.

Interpreting Results

Results of IDEXX diarrhea RealPCR panels should be interpreted in light of patient signalment, history, clinical presentation, vaccination history and other laboratory data. For example, a positive parvovirus PCR test result in a 3-month-old puppy with acute onset of vomiting, bloody diarrhea and leukopenia is very diagnostic for parvovirus enteritis. However, a positive coronavirus PCR test result in a 5-year-old well-vaccinated dog with chronic intermittent diarrhea, a good appetite and otherwise clinically healthy is likely an incidental finding, and further diagnostics to determine the etiology of the diarrhea should be considered. This dog, however, may be chronically shedding coronavirus and may be a source of infection for other dogs.

The chart on the following page contains a list of the fecal pathogens in the IDEXX Canine and Feline Diarrhea RealPCR Panels and summarizes the following for each pathogen: the common clinical signs, the prevalence reported in the literature, the prevalence from diarrhea RealPCR panels submitted over a 5-month period, the clinical significance including zoonotic potential, additional diagnostic tests that should be considered when this organism is identified and treatment recommendations. It is interesting to point out that the prevalence data from the literature for most organisms is similar to the IDEXX RealPCR prevalence data. Differences may stem from the animal populations studied and the diagnostic tests used to detect the pathogen in these studies.

When to Use IDEXX Diarrhea RealPCR Panels

1. To identify the pathogen(s) that may be causing or contributing to diarrhea in dogs and cats
2. To support timely diagnosis and initiation of appropriate therapy
3. As a surveillance tool for dog or cat populations (e.g., shelters, breeding facilities)
4. To identify and minimize human exposure to zoonotic pathogens

IDEXX Diarrhea RealPCR Panels for Dogs and Cats

Organism	*Clostridium perfringens* Enterotoxin A Gene Gram-positive bacteria	*Salmonella* spp. Gram-negative bacteria	*Cryptosporidium* spp. Coccidia	*Giardia* spp. Protozoon	*Tritrichomonas foetus* Protozoon
Species Affected	Dog, Cat	Dog, Cat	Dog, Cat	Dog, Cat	Cat
Clinical Signs	• Acute/chronic/intermittent small- and/or large-bowel diarrhea • Canine nosocomial diarrhea[1] • Hemorrhagic diarrhea (e.g., HGE) in dogs	• Fever/sepsis • Anorexia, diarrhea (may or may not be hemorrhagic), vomiting, weight loss	Acute/chronic/intermittent small- and/or large-bowel diarrhea	Acute/chronic/intermittent small- and/or large-bowel diarrhea	Chronic or recurrent large- bowel diarrhea
Prevalence (in literature)	• 7%–14% in nondiarrheic dogs[1,2] • 41% in diarrheic dogs[1,2]	• 0%–1.9% in nondiarrheic animals[3,4] • 0%–1.4% in diarrheic animals[3,4]	• 7.3% in kittens[5] • 4.7% in shelter cats[6] • 3%–10% PCR prevalence in dogs[7,8]	• Overall 8% in dogs[9] • 36%–50% in puppies[9] • Up to 100% in dogs in shelters and kennels[9] • Overall 4% in cats[9] • 9.8% in shelter cats[6] • 31% in purebred cattery cats[10]	• 31% in purebred cattery cats[10] • 14.4% of cats with diarrhea in UK[11]
IDEXX RealPCR Prevalence[b]	• 39% in dogs • 37.8% in cats	• 0.1% in dogs • 0.4% in cats	• 6% in dogs • 5.4% in cats	• 8.3% in dogs • 5.1% in cats	9.2% in cats
Clinical Significance	• Detection is likely significant[c] • No zoonotic potential	• Detection is likely significant[c] • Zoonotic potential	• Detection is significant[d] • Zoonotic potential	• Detection is significant[d] • Zoonotic potential	• Detection is significant[d] • No zoonotic potential
Additional Diagnostics Recommended	Strengthen significance of a positive *C. perfringens* enterotoxin A gene PCR test result by *C. perfringens* enterotoxin by ELISA[2,f]	Culture and sensitivity			
Treatment	• Ampicillin/amoxicillin • Metronidazole • Tylosin • Resistance to tetracyclines • High-fiber diet	• Controversial • Only if systemic illness • Based on sensitivity sting • Fluoroquinolones, chloramphenicol, trimethoprim-sulfa and amoxicillin	• Treatment often ineffective • Azithromycin • Tylosin • Paromycin (caution: nephrotoxicity)	• Fenbendazole • Febantel-praziquantel-pyrantel (Drontal® Plus) • Metronidazole (less effective)	Ronidazole[12]

[a] Vaccination with a modified live vaccine may result in positive results for up to a few weeks post vaccination.
[b] IDEXX RealPCR prevalence data from a total number of 918 samples for dogs and 944 samples for cats collected over a 5-month time frame.
[c] Detection is likely significant: The organism may be the cause of the clinical signs, contributing to the clinical signs or may indicate carrier state.
[d] Detection is significant: The organism is likely the cause of the gastrointestinal signs.
[e] Detection may not be significant: The organism is not likely the cause of the gastrointestinal signs.
[f] Test code 4030, best performed on a fresh sample.

Toxoplasma gondii Coccidia	Canine Enteric Coronavirus[a] RNA virus	Feline Coronavirus (FeCoV)[a] RNA virus	Canine Parvovirus 2[a] DNA virus	Feline Panleukopenia Virus[a] DNA virus	Canine Distemper Virus[a] RNA virus
Cat	Dog	Cat	Dog	Cat	Dog
• Usually asymptomatic • Self-limiting small-bowel diarrhea possible	• Clinical signs typically mild without coinfection • Acute diarrhea, sometimes preceded by vomiting • Presence or absence of fever	• Coronaviral enteritis – Transient, mild diarrhea, vomiting • Feline infectious peritonitis (FIP): fever, weight loss, inappetance – Noneffusive: granulomatous gastroenteritis possible with constipation, chronic diarrhea, vomiting; uveitis; neurologic signs, etc. – Effusive: pleural effusion/ascites	• Acute anorexia, diarrhea (may or may not be hemorrhagic), vomiting, dehydration • Fever/sepsis	• Acute anorexia, vomiting, dehydration with or without diarrhea • Fever/sepsis	• Mild – Respiratory: coughing, oculonasal discharge • Systemic: fever – Respiratory: coughing, oculonasal discharge – Gastrointestinal: anorexia, vomiting, diarrhea – Neurological: seizures, myoclonus, ataxia
0.9% of feline fecal samples[13]	• 15%–26% family pets[14] • 59.3% in nondiarrheic shelter dogs[15] • 73.3% in diarrheic shelter dogs[15]	• Up to 80% of cats from catteries, shelters, large multicat households[16] • Approximately 25% of cats from households with 1–2 cats and urban/suburban feral cats[16]	• No published data • High in young or unvaccinated dogs with appropriate clinical signs	19.2% in cats with diarrhea at the Clinic of Small Animal Medicine, Ludwig-Maximilians University, Munich, Germany[18]	• No published data • Likely high in young or unvaccinated dogs with appropriate systemic clinical signs including gastrointestinal signs
0.5% in cats	10.6% in dogs	60.2% in cats	3.5% in dogs	3.2% in cats	1.2% in dogs
• Detection may not be significant[e] • Zoonotic risk high for pregnant women • Zoonotic risk for immunocompromised individuals	• Detection may not be significant[e] • No zoonotic potential	• Detection may not be significant[e] • Likely not cause of diarrhea • May indicate chronic carrier • No zoonotic potential	• Detection is significant[d] • No zoonotic potential	• Detection is significant[d] • No zoonotic potential	• Detection is significant[d] • No zoonotic potential
IgG and IgM ELISA if extraintestinal signs present		• To detect chronic shedders, perform FeCoV PCR test on feces weekly for 4 consecutive weeks[17] • If FIP suspected, a positive, FeCoV PCR test result on ascites or pleural fluid, whole blood or tissues supports diagnosis	CBC: leukopenia common	CBC: leukopenia common	• CBC: lymphopenia common • Chest radiographs if respiratory signs
• Clindamycin (preferred) • Pyrimethamine-sulfonamide combination	• Supportive • Identify and treat secondary or concurrent infections	• Rarely indicated for gastrointestinal signs • No effective treatment for FIP; supportive care	• Supportive • Treat secondary infections	• Supportive • Treat secondary infections	• Supportive • Anticonvulsants if seizuring • Treat secondary infections

Ordering Information

test code	test name, contents and specimen requirements
2625	**Canine Diarrhea RealPCR™ Panel** *Giardia* spp., *Cryptosporidium* spp., *Salmonella* spp., *Clostridium perfringens* enterotoxin A gene, canine enteric coronavirus, canine parvovirus 2 and canine distemper virus RealPCR tests 5 g of fresh fecal material; 1 g minimum
2627	**Feline Diarrhea RealPCR™ Panel—Comprehensive** *Tritrichomonas foetus*, *Giardia* spp., *Cryptosporidium* spp., *Toxoplasma gondii*, *Salmonella* spp., *Clostridium perfringens* enterotoxin A gene, feline coronavirus (FeCoV) and feline panleukopenia virus RealPCR tests 5 g of fresh fecal material; 1 g minimum

Specimen requirements: 5 g fecal material (1 mg minimum) in a sterile container, keep refrigerated

Limitations: A PCR test may not detect silent carriers, especially if they are not actively shedding the infectious agent. In addition, a negative PCR test result may be caused by treatment, occurrence of new strain variations (especially parvovirus) or number of organisms below limit of detection.

Contacting IDEXX

Laboratory Customer Support

If you have any questions regarding test codes, turnaround times or pricing, please contact our Laboratory Customer Support Team at 1-888-433-9987, option 3, option 5.

Expert Feedback When You Need It

Our team of internal medicine specialists is always available for complimentary consultation. Please call 1-888-433-9987, option 4, option 2, if you have questions.

Turnaround time

The IDEXX nationwide network of reference laboratories provides daily courier service or IDEXX-Direct® service to pick up your samples and forward them to our IDEXX Molecular Diagnostics Laboratory in California. IDEXX RealPCR tests are run daily, Monday–Friday. Samples received on Saturday or Sunday are processed on Monday. You can expect results within 1–3 working days, depending on shipping time.

References

1. Kruth SA, Prescott JF, Welch MK, Brodsky MH. Nosocomial diarrhea associated with enterotoxigenic *Clostridium perfringens* infection in dogs. *JAVMA.* 1989;195(3):331–334.
2. Marks SL, Kather EJ, Kass PH, Melli AC. Genotypic and phenotypic characterization of *Clostridium perfringens* and *Clostridium difficile* in diarrheic and healthy dogs. *J Vet Intern Med*. 2002;16:533–540.
3. Cave NJ, Marks SL, Kass PH, Melli AC, Brophy MA. Evaluation of a routine diagnostic fecal panel for dogs with diarrhea. *JAVMA.* 2002;221(1):52–59.
4. Hill SL, Cheney JM, Taton-Allen GF, Reif JS, Bruns C, Lappin MR. Prevalence of enteric zoonotic organisms in cats. *JAVMA.* 2000;216:687–692.
5. Shukla R, Giraldo P, Kraliz A, Finnigan M, Sanchez AL. *Cryptosporidium* spp. and other zoonotic enteric parasites in a sample of domestic dogs and cats in the Niagara region of Ontario. *Can Vet J*. 2006;47:1179–1184.
6. Mekaru SR, Marks SL, Felley AJ, Chouicha N, Kass PH. Comparison of direct immunofluorescence, immunoassays, and fecal flotation for detection of *Cryptosporidium* spp. and *Giardia* spp. in naturally exposed cats in 4 northern California animal shelters. *J Vet Intern Med.* 2007;21(5): 959–965.
7. Giangaspero A, Iorio R, Paoletti B, Traversa D, Capelli G. Molecular evidence for *Cryptosporidium* infection in dogs in Central Italy. *Parasitol Res.* 2006;99(3):297–299.
8. Abe N, Sawano Y, Yamada K, Kimata I, Iseki M. *Cryptosporidium* infection in dogs in Osaka, Japan. *Vet Parasitol.* 2002;108(3):185–193.
9. Kirkpatrick CE. Enteric protozoal infections, in Greene CE (ed): Infectious diseases of the dog and cat. Philadelphia, Pa: WB Saunders; 1990:804–814.
10. Gookin JL, Stebbins ME, Hunt E, et al. Prevalence of and risk factors for feline *Tritrichomonas* and *Giardia*. *J Clin Microbiol.* 2004;2707–2710.
11. Gunn-Moore DA, McCann TM, Reed N, Simpson KE, Tennant B. Prevalence of *Tritrichomonas foetus* infection in cats with diarrhœa in the UK. *J Feline Med Surg*. 2007;9(3):214–8.
12. Gookin JL, Copple CN, Papich MG, Poore MF, Stauffer SH, Birkenheuer AJ, Twedt DC, Levy MG. Efficacy of ronidazole for treatment of feline *Tritrichomonas foetus* infection. *J Vet Intern Med.* 2006;20:536–543.
13. Dabritz HA, Miller MA, Atwill ER, Gardner IA, Leutenegger CM, Melli AC, Conrad PA. Detection of *Toxoplasma gondii*-like oocysts in cat feces and estimates of the environmental oocyst burden. *JAVMA.* 2007;231(11):1676–1684.
14. Mochizuki M, Hashimoto M, Ishida T. Recent epidemiological status of canine viral enteric infections and *Giardia* infection in Japan. *Jap J Vet Sci.* 2001;63:573–575.
15. Sokolow SH, Rand C, Marks SL, Drazenovich NL, Kather EJ, Foley JE. Epidemiologic evaluation of diarrhea in dogs in an animal shelter. *AJVR.* 2005;66:1018–1024.
16. Pedersen NC. An overview of feline enteric coronavirus and infectious peritonitis virus infections. *Feline Practice.* 1995; 23(3):7–20.
17. Lutz H. Biology of feline coronavirus and its control. Proceedings from: 28th World Congress of the World Small Animal Veterinary Association; October 24–27, 2003; Bangkok, Thailand.
18. Neuerer FF, Horlacher K, Truyen U, Hartmann K. Comparison of different in-house test systems to detect parvovirus in faeces of cats. *J Feline Med Surg.* 2008;10(3):247–251.

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