Quick Resource Guide

Diagnosis and Dietary Management of Gastrointestinal Disease

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PURINA VETERINARY DIETS®

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HISTORY-TAKING TIPS

PHYSICAL EXAMINATION TIPS

DIAGNOSTIC TEST TIPS

GI ALGORITHMS

PURINA VETERINARY DIETS® FOR GI SUPPORT

DIAGNOSIS AT YOUR FINGERTIPS

Download our free iPhone GI Diagnostic app for easy access to the diagnostic algorithms. Make diagnosis of your patients' condition easier than ever — wherever you are.

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History–Taking Tips

GASTROINTESTINAL (GI) PROBLEMS ARE A COMMON COMPLAINT AT VETERINARY HOSPITALS. LOCALIZING THE PROBLEM IS THE FIRST STEP IN MAKING A CORRECT DIAGNOSIS. IN ADDITION TO TAKING A HISTORY, PERFORMING THE PHYSICAL EXAM AND OBTAINING A MINIMUM DATABASE, THE USE OF TIMESAVING GI ALGORITHMS CAN HELP TRACE NORMAL AND ABNORMAL SIGNS, TEST RESULTS, RULE-OUTS, AND NEXT STEPS TOWARD RESOLVING THE PROBLEM.

DIAGNOSING GI DISEASE

Although one may be tempted to take a cursory history for a seemingly simple complaint, a thorough evaluation of all body systems may be necessary to determine the cause of GI signs. Often the more nebulous the problem, the more important the history. Not only is the GI tract the way food — and sometimes a foreign object — enters the body, the GI tract is of paramount importance in maintaining the overall health of the pet. It is the means for nourishment and elimination of waste and an important route for drug delivery. In addition to what goes into and is assimilated (or not) by the GI tract, underlying disease can have an effect on GI function. Secondary GI disease is caused by an underlying disorder (or disorders that may lie outside of the intestinal tract), but primary GI disease is concerned only with the GI tract and its functionality.

Listening to the pet owner while getting a history is as important as the physical exam and appropriate testing. Information on day-to-day eating and elimination habits, food types, and observed behavior helps in selecting the appropriate diagnostic tests and making beneficial therapeutic recommendations. The owner can assist in this by filling out a written history before the pet's visit, or at least prior to the examination.

BASIC CONSIDERATIONS

- **Recognize the difference** between vomiting and regurgitation as well as the difference between small and large bowel disease — key to correctly diagnosing and treating GI disease.

- **Ask questions directed at the presenting complaint.** For example, for a complaint of constipation and dehydration: "Does your dog/cat drink or urinate excessively?" This type of question may help differentiate secondary constipation caused by renal disease from primary gastrointestinal disease.

- **Localize the cause** and determine if the condition is primary or secondary GI disease. Identifying the location of the problem will assist in choosing a plan of action — e.g., laparotomy for investigating generalized bowel disease versus colonoscopy for primary large bowel disease.

- **Signalment** may be very important. In an unvaccinated young puppy with fever, anorexia, vomiting and profuse bloody diarrhea, infectious causes such as parvo or distemper virus would be at the top of the list of suspects. In a kitten from a cattery, *Tritrichomonas* may be one of the first pathogens to look for if large bowel diarrhea is the complaint. Weight loss with an increased appetite has fewer differentials (eg, diabetes mellitus in the dog, hyperthyroidism in the cat) than does weight loss with anorexia. Questions about the general health of the pet, such as the presence of polyuria/polydipsia, may help narrow the differential list.

- **Take the time to ask open-ended questions** of the pet owner — it will pay off in the long run with valuable clues for the selection of diagnostics. For example, if you ask the owner: "Does your dog have diarrhea?" The answer may be "no," as the owner has not observed the dog's stools because it defecates outside the house. If the question is asked in an open-ended manner, such as: "Describe your dog's stools," then the client is free to elaborate on the type of abnormalities that may have been observed.

OBTAINING A DIETARY HISTORY

The dietary history is another key component for diagnosing GI disease. It can assist in identifying dietary indiscretions up front as well as help pinpoint the need for a change in food or for dietary support for an underlying condition.

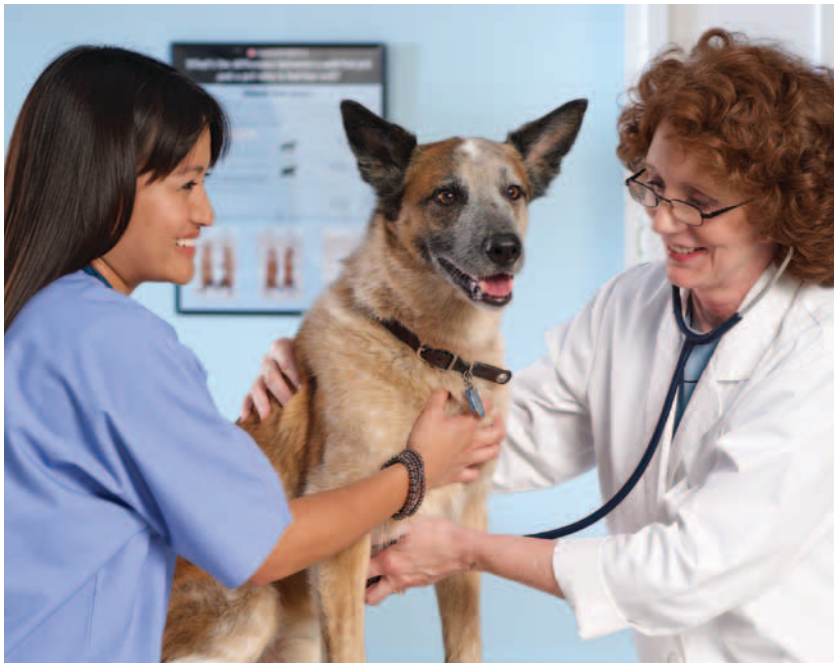
An additional concern is that clients are often misinformed about dietary concerns in GI disease and may give confusing or incorrect information about a pet's eating habits. The history questionnaire on page 6 includes dietary information and is often the best and most expedient way of dealing with the more common areas of misunderstanding, such as:

- **Treats and other dietary items** (table food, vitamins, etc.) are often not perceived as part of a pet's diet.
- **More than one family member feeding food or treats** without mentioning it to the primary caregiver, or the consumption of food intended for other household pets.
- **Withholding certain foods**, food flavors, or foods with certain ingredients such as corn or wheat because of worries about "allergies" or other misinformation.
- **Some clients may be embarrassed** or unwilling to divulge exactly what and how much is being fed to their pet for fear of being judged negatively.

CHECKLIST — HISTORY

- Localize the problem.
- Note the pet's physical condition and BCS.
- Recognize the difference between vomiting and regurgitation.
- Recognize the difference between small and large bowel diarrhea.
- Be precise in determining the primary complaint.
- Ask owners open-ended questions, not leading questions.
- Listen to the owner — only he or she knows this pet's particular habits.
- Ask owners to describe the stool or vomitus in their own words.
- Don't rush the owner.
- Don't ignore, but don't give too much weight to, previous medical complaints or diagnoses.
- Don't try to lump all complaints into one diagnosis, which can result in early exclusion of the correct diagnosis.
- Don't assume that "common diseases occur commonly."
- Pay attention to dietary history and signalment.
- Use history forms that owners can fill out before the visit or in the waiting room.

A CONCERN IS THAT CLIENTS ARE OFTEN MISINFORMED ABOUT DIETARY CONCERNS IN GI DISEASE AND MAY GIVE CONFUSING OR INCORRECT INFORMATION ABOUT A PET'S EATING HABITS.



Patient History Worksheet

Please fill out before hospital visit or in the waiting room

Pet's Name _____ Age ___ Breed _____

☐ Cat ☐ Dog ☐ Male ☐ Female ☐ Neutered ☐ Spayed

SIGNS — VOMITING OR REGURGITATION

- Is there abdominal effort or is it more of a passive act?____
_____
- How many times a day? _____
- What is the character of the vomitus? _____
- Is food digested? _____Or undigested? _____
- Are there any nonfood items? _____
- Is there any fresh blood? _____
- Is there a "coffee grounds" appearance?_____
- What is the shape of the vomitus?_____
- Does your pet have bad breath?_____

SIGNS — DIARRHEA

- How many stools a day? _____
- What is the character of the stools? _____
- Is there any fresh blood? _____
- Is there any mucus? _____
- Are the stools bulky?_____Or thin?_____
- What is the shape of the stools? _____
- Is the stool color normal for your pet? _____
- What color is the stool? _____

HISTORY

- How long has your pet been ill?_____
- Has your pet lost weight?___ How much?_____
- Is your pet exclusively indoors? _____ Outdoors? _____ Or both? _____
- How many dogs are in your household?_____
- How many cats are in your household? _____
- Any other pets?_____
_____
- What is your pet's vaccination history?_____
_____
- Does your pet have a chronic condition (arthritis, diabetes, etc)? _____
- Is your pet taking any drugs (heartworm preventative, dewormer, digoxin, NSAID, etc)? _____
- Does your pet have access to garbage or "people food"?
_____
- Any change in water consumption? _____
- Any change in urination habits?_____
- Difficulty defecating? _____
- Any access to household or garden chemicals? _____
_____
- Any toys/nonfood items/small household objects missing?
_____
- Any change in exercise habits? _____
- Any change in behavior, eyesight, body posture?_____
_____
- Any change in your household environment (eg, remodeling, relocation, new members, absent members, new pets)?___
_____

DIETARY HISTORY

- Is the pet food homemade, raw, commercial? _____
- Is it primarily dry food, canned food, or a mixture of dry and canned foods? _____
- If it's a commercial food, what brand, formula and flavor is it?
_____
- If the food is homemade, what are the ingredients and amounts of each ingredient? _____
_____
_____
- How long has the food been fed?_____
- How frequently is the type of food changed?_____
- When was the type of food last changed? _____
- How much food is actually eaten per day? _____
- How is food measured (weight vs volume)? _____
_____
- Is the pet fed ad libitum or with measured portions? _____
_____
- How many times per day is the pet fed?_____
- Who feeds the pet (ages of children, grandparents, etc)? __
_____
- If there are other pets in the household, what are they being fed?_____
- Does the pet have access to the outdoors?_____
- Does the pet receive additional items (treats, vitamins, etc)?
_____
- Does the pet receive "people food"? _____
- Are medications administered by mouth or in food (amount and type)? _____
- Does the pet eat nonfood items (tissues, clothing, diapers, etc)?
_____
- Is milk given?_____
- Is fresh water provided daily? _____
_____

Physical Examination Tips

FIRST THINGS FIRST

Once a history and dietary information have been taken, the next step is to assess the presenting GI problem. Tips for **Localizing GI disease** as well as **Distinguishing vomiting from regurgitation** and **Distinguishing small from large bowel diarrhea** are located on this page. They will aid in the physical exam, selecting diagnostic tests and using the diagnostic **GI Algorithms** on pages 16 through 27.

POSTURE, BEHAVIOR & ATTITUDE

- **Lack of alertness** may indicate metabolic problems such as hepatic encephalopathy.
- **Abnormal posture** eg, animals with severe pancreatitis may assume the "praying" position in an effort to alleviate cranial abdominal pain.
- **Generalized muscle weakness** along with GI signs is characteristic of hypoadrenocorticism.
- **Salivation and "lip smacking"** indicate nausea, gastric or esophageal foreign bodies, or hepatic encephalopathy in cats.
- **Aversion to food** can be a sign of nausea.
- **Distended abdomen** may indicate ascites, a large abdominal tumor, or gas accumulation due to gastric dilatation/volvulus (GDV).

VITAL SIGNS & PHYSICAL CONDITION

- **Systemic signs,** such as fever, tachycardia or poor physical condition, may indicate whether a GI problem is primary or secondary.
- **Body condition score** (**BCS charts** on pages 10 and 11) helps to assess general wellness and physical condition and allows for comparison each time the pet is seen. The impact of chronic disease on weight gain or weight loss (and vice versa) can assist in making a correct diagnosis and recommending dietary support.
- **Hydration abnormalities,** such as increased capillary refill time, tacky membranes and skin turgor, may indicate dehydration severity.
- **Eye and skin signs,** such as pallid sclera and membranes, numerous small points of hemorrhage (petechiation), and yellowing of skin and whites of the eyes (icterus), may indicate systemic disease.

LOCALIZING GI DISEASE

UPPER GI

- **Regurgitation** – Esophageal disease; gastric motility disorder
- **Excessive salivation** – Hepatic encephalopathy in cats, foreign body in dogs
- **Oral ulceration** – Chronic kidney disease, immunocompromise (FIV, FeLV in cats)
- **Halitosis** – Foreign body, chronic small bowel problem, periodontitis

LOWER GI

- **Borborygmus** – Noises from abnormal carbohydrate and protein fermentation are indicative of colitis, inflammatory bowel disease or antibiotic-responsive diarrhea.

- **Guarded abdomen** – Pain because of an obstruction
  - — Left cranial abdomen for hepatic pain
  - — Dorsal for cecum
  - — Dorsocranial for intussusception
  - — Right cranial for pancreatitis

DISTINGUISHING VOMITING FROM REGURGITATION

VOMITING	REGURGITATION
Active (abdominal contractions)	Passive (no abdominal contractions)
Unrelated to food intake	Shortly after eating
Digested food	Undigested food
Bile/blood	No bile/blood
Low pH	Neutral pH

DISTINGUISHING SMALL FROM LARGE BOWEL DIARRHEA

SIGN	SMALL BOWEL	LARGE BOWEL
Constipation/ tenesmus	Rare	Common
Frequency	Normal to 2 to 3x normal	> 3x normal
Urgency	Uncommon	Common
Volume	Increased	Decreased
Mucus	Rare	Common
Fresh blood	Uncommon	Common
Weight loss	Common	Uncommon

CHECKLIST — GI DISEASE

A COMPLETE PICTURE OF THE PATIENT IS NEEDED TO DIFFERENTIATE PRIMARY FROM SECONDARY GI DISEASE.

- History
- Dietary history
- BCS
- Localization
- Vomiting vs regurgitation
- Small vs large bowel diarrhea
- Acute (presence of mucus or blood)
- Chronic
- Physical examination
- Diagnostic tests
- Algorithms for decision making

HEAD & MOUTH

- **Tongue** should be examined at the root in order to rule out string or foreign bodies.
- **Loss of senses** (sight or smell), presence of **dental disease** or **temporal muscle atrophy** (myositis) may indicate a secondary cause for anorexia (pseudoanorexia).
- **Neck and throat** palpation may reveal foreign bodies or pain indicative of underlying disease, as in dysphagia (difficulty swallowing) or regurgitation.

ESTABLISHING A SYSTEMATIC GI EXAM ROUTINE WILL AID IN IDENTIFYING ABNORMALITIES.

AUSCULTATION OF THE CHEST

- **Air, fluid, abnormal heart rhythms, etc.** For example, bradycardia is characteristic of hypoadrenocorticism or can indicate increased vagal tone. Heart murmurs may indicate anemia.
- **Fluid in the chest and abdomen** can be caused by heart failure, liver disease resulting in hypoalbuminemia, or protein-losing enteropathies (PLE).
- **Arrhythmias or cardiac murmurs** would indicate that heart failure is a possibility and that GI signs may be secondary to venous congestion in the intestines.
- **Abnormal lung sounds** may indicate aspiration pneumonia secondary to megaesophagus.
- **Increased respiratory rate or dyspnea** may indicate esophageal problems, such as foreign bodies that can cause pain.

ABDOMINAL PALPATION & FECAL EXAM

- **Identify each organ in the abdominal cavity** starting with the liver, followed by the kidneys (easier to palpate in the cat), bladder, spleen and intestines.
- **Assess each organ** for size (is the liver protruding past the ribs?), symmetry and texture.
- **Intestinal lymph nodes** may be palpable, in the mesentery if enlarged.
- **Intussusception of the intestine** will be identified by the presence of a large, firm tubular section of bowel.
- **Foreign bodies** such as bones, peach pits, corncobs and plastic toys may be readily palpable, depending on their location within the intestine.
- **Palpate cranial abdomen** (lift the forelegs) for additional assessment of the internal organs.
- **Rectal/fecal examination** – Rectum and anus should be palpated 360° for the presence of tumors, thickening or foreign material. Pay particular attention to the anal sacs to rule out impaction or tumors; expression of the anal sacs will help to determine the location of a mass if detected. This is an excellent opportunity to obtain a stool sample for fecal examination.

DIAGNOSTIC TESTS

Test results help differentiate primary from secondary disease and can help pinpoint treatment and dietary support protocols. Start with the minimum database (MDB) and add appropriate tests as needed for species, breed, age and circumstances. See **DIAGNOSTIC TEST TIPS** section on pages 12 through 15 for common differentials.

ALGORITHMS FOR DECISION MAKING

Along with the history, physical examination and diagnostic tests, the **GI Algorithms** provided on pages 16 through 27 are designed to assist the practitioner in differentiating disease as well as making decisions for treatment and dietary support protocols. It is important to keep in mind what judgements have already been made during history taking, the physical exam and minimum database collection when using the algorithms. The animal's condition and circumstances also are important because GI disease can be complicated.

DIAGNOSTIC TESTS FOR GI DISEASE

TESTS FOR MDB

- Urinalysis (including urine specific gravity)
- Fecal direct examination/scoring
- Fecal parasite examination
- Fecal cytology
- Complete blood count (CBC)
- Serum chemistry profile
- TT_4 (total thyroxine)

ADDITIONAL TESTS AS NEEDED

- Canine virology (parvovirus)
- Feline virology (FeLV, FIV)
- Pancreatic lipase immunoreactivity (dog = cPLI, cat = fPLI)
- Malabsorption profile (trypsin-like immunoreactivity, vitamin B_{12} and folate)
- Fecal alpha-1 protease
- Thoracic and abdominal radiography, ultrasonography, laparotomy

EVERY PET VISIT SHOULD INCLUDE A BODY CONDITION ASSESSMENT THAT IS RECORDED IN THE PATIENT FILE FOR COMPARISON FROM VISIT TO VISIT (SEE NEXT PAGE FOR PURINA BODY CONDITION SYSTEM™ GUIDELINES).

Nestlé PURINA
Body Condition System

TOO THIN

1 Ribs, lumbar vertebrae, pelvic bones and all bony prominences evident from a distance. No discernible body fat. Obvious loss of muscle mass.

2 Ribs, lumbar vertebrae and pelvic bones easily visible. No palpable fat. Some evidence of other bony prominence. Minimal loss of muscle mass.

3 Ribs easily palpated and may be visible with no palpable fat. Tops of lumbar vertebrae visible. Pelvic bones becoming prominent. Obvious waist and abdominal tuck.

IDEAL

4 **Ribs easily palpable, with minimal fat covering. Waist easily noted, viewed from above. Abdominal tuck evident.**

5 **Ribs palpable without excess fat covering. Waist observed behind ribs when viewed from above. Abdomen tucked up when viewed from side.**

TOO HEAVY

6 Ribs palpable with slight excess fat covering. Waist is discernible viewed from above but is not prominent. Abdominal tuck apparent.

7 Ribs palpable with difficulty; heavy fat cover. Noticeable fat deposits over lumbar area and base of tail. Waist absent or barely visible. Abdominal tuck may be present.

8 Ribs not palpable under very heavy fat cover, or palpable only with significant pressure. Heavy fat deposits over lumbar area and base of tail. Waist absent. No abdominal tuck. Obvious abdominal distention may be present.

9 Massive fat deposits over thorax, spine and base of tail. Waist and abdominal tuck absent. Fat deposits on neck and limbs. Obvious abdominal distention.

The **BODY CONDITION SYSTEM** was developed at the Nestlé Purina Pet Care Center and has been validated as documented in the following publications:

Mawby D, Bartges JW, Moyers T, et. al. ***Comparison of body fat estimates by dual-energy x-ray absorptiometry and deuterium oxide dilution in client owned dogs.*** *Compendium 2001; 23 (9A): 70*

Laflamme DP. ***Development and Validation of a Body Condition Score System for Dogs.*** *Canine Practice July/August 1997; 22:10-15*

Kealy, et. al. ***Effects of Diet Restriction on Life Span and Age-Related Changes in Dogs.*** *JAVMA 2002; 220:1315-1320*

Call 1-800-222-VETS (8387), weekdays, 8:00 a.m. to 4:30 p.m. CT

Nestlé PURINA

Nestlé PURINA

Body Condition System

TOO THIN

1 Ribs visible on shorthaired cats; no palpable fat; severe abdominal tuck; lumbar vertebrae and wings of ilia easily palpated.

2 Ribs easily visible on shorthaired cats; lumbar vertebrae obvious with minimal muscle mass; pronounced abdominal tuck; no palpable fat.

3 Ribs easily palpable with minimal fat covering; lumbar vertebrae obvious; obvious waist behind ribs; minimal abdominal fat.

4 Ribs palpable with minimal fat covering; noticeable waist behind ribs; slight abdominal tuck; abdominal fat pad absent.

IDEAL

5 **Well-proportioned; observe waist behind ribs; ribs palpable with slight fat covering; abdominal fat pad minimal.**

TOO HEAVY

6 Ribs palpable with slight excess fat covering; waist and abdominal fat pad distinguishable but not obvious; abdominal tuck absent.

7 Ribs not easily palpated with moderate fat covering; waist poorly discernible; obvious rounding of abdomen; moderate abdominal fat pad.

8 Ribs not palpable with excess fat covering; waist absent; obvious rounding of abdomen with prominent abdominal fat pad; fat deposits present over lumbar area.

9 Ribs not palpable under heavy fat cover; heavy fat deposits over lumbar area, face and limbs; distention of abdomen with no waist; extensive abdominal fat deposits.

Call 1-800-222-VETS (8387), weekdays, 8:00 a.m. to 4:30 p.m. CT

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Diagnostic Test Tips

URINALYSIS

Urine evaluation can give an overall indication of health and can also be used to rule diseases in or out. A lot has been written about urinalysis, but here are a few key issues for GI disease.

- Hydration status
- Urinary tract infection
- Kidney function
- Endocrine disease (diabetes)
- Protein-losing nephropathy

BASIC FECAL EXAMINATION

The basic fecal examination is one of the most important aspects of the minimum database for GI disease. The basic fecal exam consists of three parts.

PART 1 – Direct examination. Look for abnormal color or consistency, and observe and record shape if possible (see **Fecal scoring** on opposite page). Acholic (colorless or pale) stools may indicate exocrine pancreatic insufficiency (EPI) or bile duct obstruction. The stool should be examined for the presence of melena, fresh blood, mucus or nonfood material (string, carpet, plastic, rock). Greasy stools are indicative of EPI or malabsorptive conditions, such as protein-losing enteropathies (PLE). Put a small amount of stool on a glass slide with a coverslip. In cats, look for *Tritrichomonas foetus*, particularly in kittens from catteries. *Giardia* trophozoites may also be detected by direct smear (feces mixed with saline). Coccidian oocysts (protozoa) may be observed.

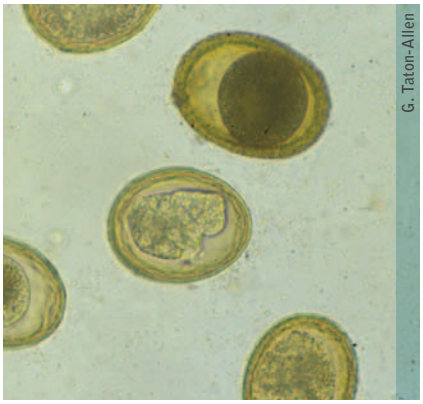
PART 2 – Fecal parasite examination. Flotation may identify nematode worm eggs such as *Toxocara* and *Ancylostoma*. It may be helpful to use zinc sulfate centrifugation for whipworm eggs (*Trichuris*) and *Giardia* cysts. As primary parasites, ascarids (*Toxocara* and *Toxascaris*) are rarely a cause of diarrhea, but a large infestation can obstruct a small puppy or kitten's GI tract, resulting in vomiting.

PART 3 – Fecal cytology. A simple smear of feces or rectal scraping can be stained with Diff-Quik (Romanowski stain) to identify cells such as neutrophils and eosinophils. Characteristically shaped "safety pin" spores of *Clostridium* or spirochetes such as *Campylobacter* may be identified under the microscope at high power. Acid-fast stains may identify *Cryptosporidium* and mycobacteria. In endemic areas, intracellular fungal infections, such as with *Histoplasma*, may be found.

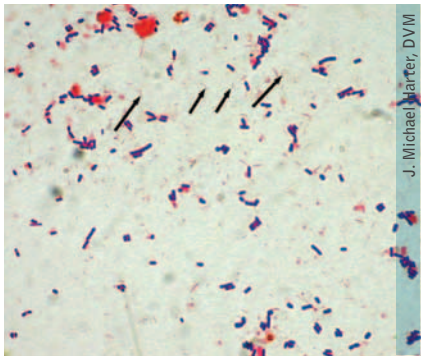
OTHER FECAL TESTS

Fecal antigen tests – If a thorough fecal exam, including direct smear (feces mixed with saline), flotation and zinc sulfate centrifugation is negative for *Giardia*, a fecal *Giardia* antigen test may be indicated. Approximately 25% of *Giardia* patients can be negative on fecal exam, but positive for *Giardia* antigen. A young puppy with a history of vomiting and diarrhea should have a parvovirus antigen test to rule out this potentially fatal disease.

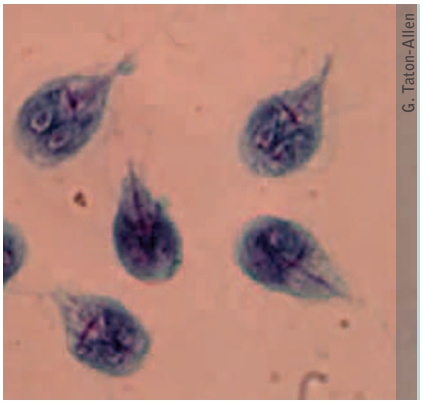
Fecal culture – If the dietary history indicates that a raw food diet is being fed, a *Salmonella* culture may be indicated. In some cases, overgrowth of pathogens such as drug-resistant *E coli* and *Campylobacter* may induce chronic relapsing diarrhea. In such cases, fecal culture may be helpful.



Toxascaris and *Toxocara* eggs



Campylobacter organisms in fecal smear. Notice the small size compared to normal bacteria in the sample.



Giardia trophozoites

FECAL SCORING

SCORE 1
Very hard and dry; often expelled as individual pellets; requires much effort to expel from body; no residue left on ground when picked up.

SCORE 2
Firm, but not hard; pliable; segmented in appearance; little or no residue on ground when picked up.

SCORE 3
Log-shaped; little or no visible segmentation; moist surface; leaves residue on ground, but holds form when picked up.

SCORE 4
Very moist, soggy; log-shaped; leaves residue and loses form when picked up.

SCORE 5
Very moist, but has a distinct shape; piles rather than distinct logs; leaves residue and loses form when picked up.

SCORE 6
Has texture, but no defined shape; present as piles or spots; leaves residue when picked up.

SCORE 7
Watery; no texture; flat puddles.

Fecal consistency is primarily a function of the amount of moisture in the stool and can be used to identify changes in colonic health and other problems. Ideally, in a healthy animal, stools should be firm but not hard, pliable and segmented, and easy to pick up (Score 2).

EXAMINATION OF AN ENTIRE STOOL ALONG WITH FECAL SCORING PROVIDES INSIGHT INTO THE FUNCTION OF THE INTESTINAL TRACT AND A BASELINE FOR ASSESSING IMPROVEMENT.

SEROLOGIC TESTS

- **Complete blood count** (see **CBC results** chart)
- **Serum chemistry profile** (see **Serum chemistry profile results** chart)
- **TT_4** – Thyroid status may help explain some GI signs.
- **Virology** – Tests for FeLV and FIV (feline) and parvovirus (canine) can explain possible primary GI disease signs.

INTESTINAL FUNCTION TESTS

Most intestinal function tests are not practical in clinical settings, but can be helpful in assessing the following:

- **Serum trypsin-like immunoreactivity** (TLI) may be helpful in assessing pancreatic insufficiency.
- **Serum pancreatic lipase immunoreactivity** (PLI) may be helpful in assessing pancreatitis. Specific feline and canine tests are available.
- **Serum vitamin B_{12}** (cobalamin) may be used to assess deficiency resulting from ileal disease or pancreatic insufficiency.
- **Serum folate** levels increase with bacterial overgrowth and in antibiotic responsive diarrhea.
- **Fecal alpha-1 protease** may be an indicator of early PLE.

RADIOGRAPHY VERSUS ULTRASOUND

- **Abdominal radiography** is of limited value in most chronic disorders. In acute vomiting cases, however, radiographs are indicated to rule out foreign bodies, gastric dilatation/volvulus (GDV), intussusception and obvious tumors.
- **Thoracic radiography** is helpful in assessing the esophagus in cases of retching or regurgitation.

MOST INTESTINAL FUNCTION TESTS ARE NOT PRACTICAL IN CLINICAL SETTINGS, BUT CAN BE HELPFUL IN ASSESSING PRIMARY DISEASE.

CBC RESULTS — SOME POSSIBLE DIFFERENTIALS

FINDING	INDICATION(S)
Macrocytosis without anemia	Hyperthyroidism
High PCV	Severe dehydration
Low PCV	Vitamin B_{12} deficiency, bleeding tumor, ulcers, exocrine pancreatic insufficiency (EPI), liver disease
Hypochromic microcytic anemia	Chronic blood loss such as from GI bleeding
Leukopenia	Parvovirus, panleukopenia
Lymphopenia	Lymphangiectasia
Inflammatory leukogram	Infectious diarrhea
B_{12} deficiency	Macrocytic anemia (pancreatic disease or ileal inflammation in cats)
Negative stress leukogram	Hypoadrenocorticism (dogs)
Eosinophilia	Parasitism, neoplasia

PCV = packed cell volume

- **Abdominal ultrasonography** may be very helpful to assess the location of disease within the GI tract. Specifically, ultrasound may be helpful in detecting gastric ulceration, gastric masses and thickening of the stomach lining. The intestines can be assessed for localized disease (eg, ileal tumor) and thickening and enlargement of mesenteric lymph nodes, which may indicate neoplasia. The liver and pancreas also can be evaluated.

ENDOSCOPY VERSUS LAPAROTOMY

- **Endoscopy** with guided biopsy can be a valuable tool if the history and physical exam, MDB, and ancillary tests indicate the location of the lesion within the GI tract or the clinician suspects generalized GI disease or disease localized to the stomach, duodenum or colon. The risk of dehiscence is low with endoscopic biopsies; therefore, this is the method of choice for dogs with fragile intestines and low protein due to PLE. Endoscopy can be performed multiple times. There are limitations, of course, including small biopsy size, forceps artifacts on biopsies, inability to biopsy the jejunum and, most important, the inability to obtain full-thickness samples.

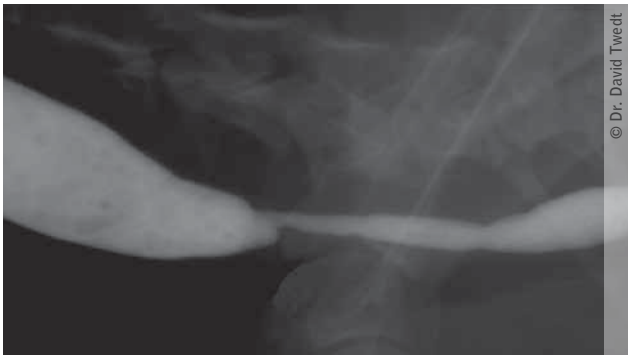
SERUM CHEMISTRY PROFILE RESULTS — SOME POSSIBLE DIFFERENTIALS

FINDING	INDICATION(S)
Decreased Na/K ratio	Hypoadrenocorticism, whipworm infection, third space fluid accumulation
Decreased Ca and Mg	PLE
Increased P, BUN/CREA	Renal disease
Increased BUN/CREA	Hypoadrenocorticism, renal disease, whipworms
Increased liver enzymes	Liver disease, hyperthyroidism, pancreatitis, gallbladder disease
Decreased total protein (TP)	PLE
Decreased albumin	PLE, PLN, liver disease
Decreased cholesterol	PLE
Increased ALP	Biliary disease
Increased ALT	Hepatic necrosis, toxic hepatopathy, compromised GI function

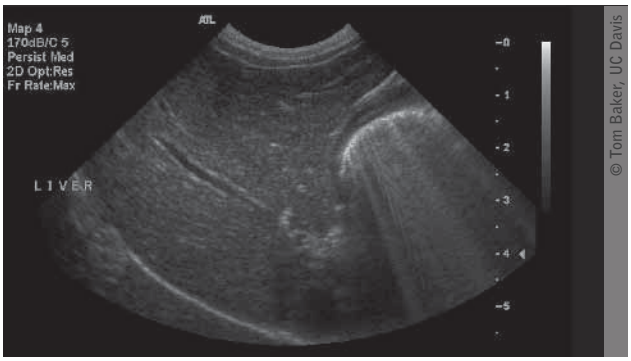
ALP = alkaline phosphatase
ALT = alanine aminotransferase
BUN = blood urea nitrogen
Ca = calcium
CREA = creatinine
K = potassium
Mg = magnesium
Na = sodium
P = phosphorus
PLE = protein-losing enteropathy
PLN = protein-losing nephropathy

- **Exploratory laparotomy** with full-thickness biopsies might be indicated if the history and physical exam indicate that the gastrointestinal disease is localized — particularly if there is a suggestion of duodenal, jejunal or ileal involvement. The disadvantage of exploratory surgery is the length of anesthesia and the risk of dehiscence, particularly in patients with low serum protein. The advantage is that the biopsies are full thickness, multiple organs can be biopsied, and the biopsies can be taken from grossly affected tissues within the abdominal cavity.

IMAGING AND BIOPSY ARE VALUABLE TOOLS FOR LOCALIZING AND IDENTIFYING PRIMARY OR SECONDARY DISEASE.



A barium-food mixture esophogram in a cat showing dilatation of the cervical esophagus with a luminal narrowing at the thoracic inlet (arrow).



Ultrasound of normal liver and stomach.

Endoscopic appearance of the proximal duodenum of a dog with inflammatory bowel disease showing marked granularity of the mucosa, consistent with diffuse inflammation.

GI Algorithms

DIAGNOSIS AT YOUR FINGERTIPS

Download our free iPhone GI Diagnostic app
for easy access to the following diagnostic algorithms.

COMBINED CANINE & FELINE

THE GI ALGORITHMS ON THE FOLLOWING PAGES EMPLOY THE ABBREVIATIONS AND CONVENTIONS BELOW AND INDICATE WHICH PURINA VETERINARY DIETS® FORMULAS ARE APPROPRIATE IN EACH SITUATION.

ABBREVIATIONS

ACh	Acetylcholine
ACTH	Adrenocorticotropic hormone
Ag	Antigen
BCS	Body condition score
BW	Body weight
BUN/CREA	Blood urea nitrogen/creatinine
CKD	Chronic kidney disease
CSF	Cerebrospinal fluid
cPLI	Canine pancreatic lipase immunoreactivity
cTSH	Canine thyroid stimulating hormone
ELISA	Enzyme-linked immunosorbent assay
EPI	Exocrine pancreatic insufficiency
fPLI	Feline pancreatic lipase immunoreactivity
GDV	Gastric dilatation/volvulus
GSD	German shepherd dog
H	Hour
IBD	Irritable bowel disorder
IgA	Immunoglobulin A
K^+	Ionized potassium
MCT	Medium-chain triglycerides
MDB	Minimum database
Na	Sodium
NSAIDs	Nonsteroidal anti-inflammatory drugs
PE	Physical exam
P	Protein
PLE	Protein-losing enteropathy
PLN	Protein-losing nephropathy
PEG	Percutaneous endoscopic gastrostomy
RAA	Right aortic arch
RER	Resting energy requirement
SIBO	Small intestinal bacterial overgrowth
SpGr	Specific gravity
TLI	Trypsin-like immunoreactivity
TT_4	Total thyroxine
UA	Urinalysis
UPC	Urine protein:creatinine ratio
URI	Upper respiratory infection
UR	Urine
Vit	Vitamin

PURINA VETERINARY DIETS® & SUPPLEMENTS FOR GI SUPPORT*

DCO	Dual Fiber Control® Canine
DM	Dietetic Management® Feline
DRM	Dermatologic Management® Canine
EN	Gastroenteric® Canine & Feline
HA	Hypoallergenic® Canine & Feline
NF	Kidney Function® Canine & Feline
OM	Overweight Management® Canine & Feline
FortiFlora®	Nutritional Supplement

Complete listing available at PurinaVeterinaryDiets.com.

LEGEND

GI Algorithms apply to both dog and cat. When they differ, the canine diet recommendation is in GREEN and the feline diet recommendation is in BLUE.

■ Canine ■ Feline

ABNORMAL	PURSUE DIAGNOSIS
NORMAL	RULE OUT

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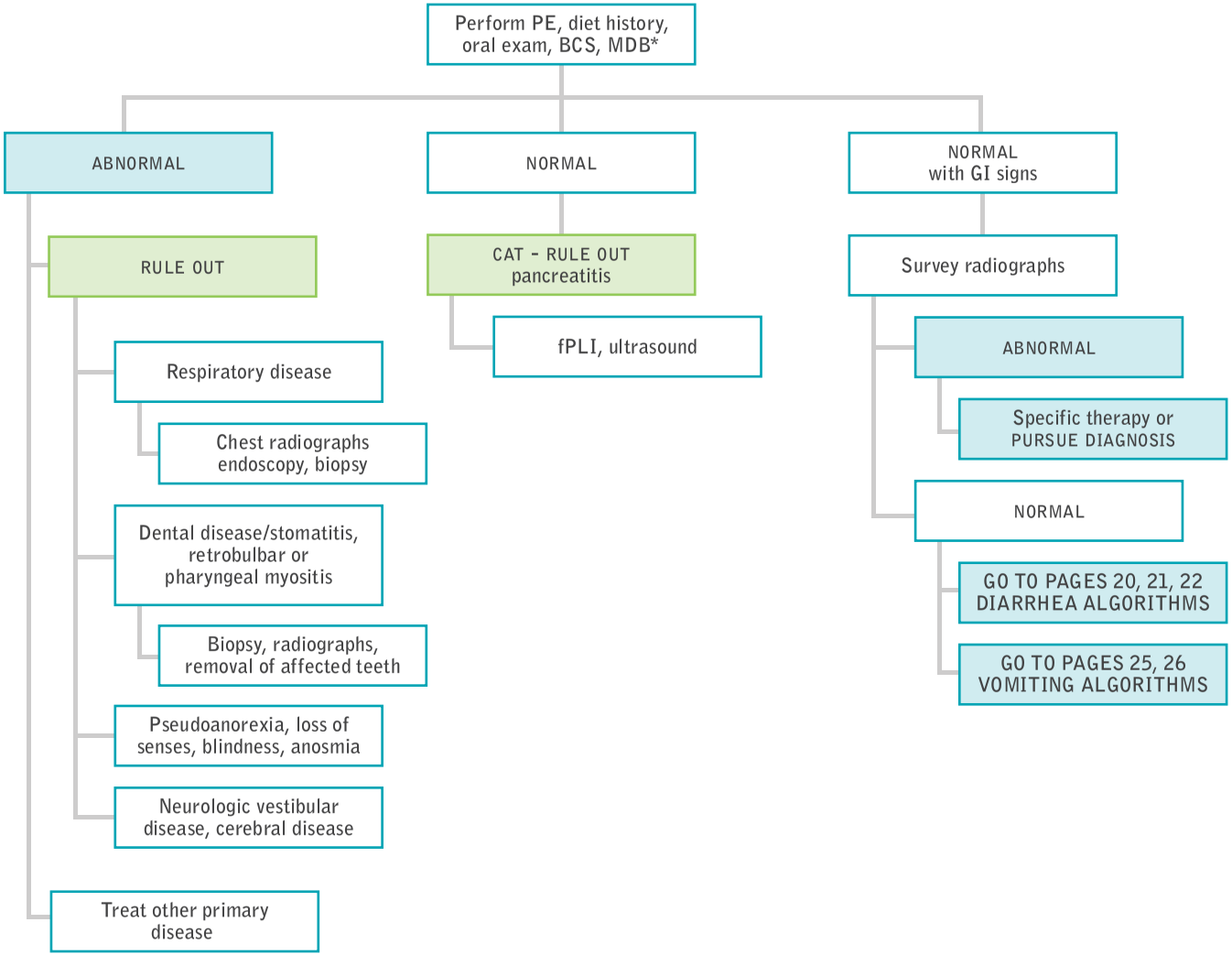
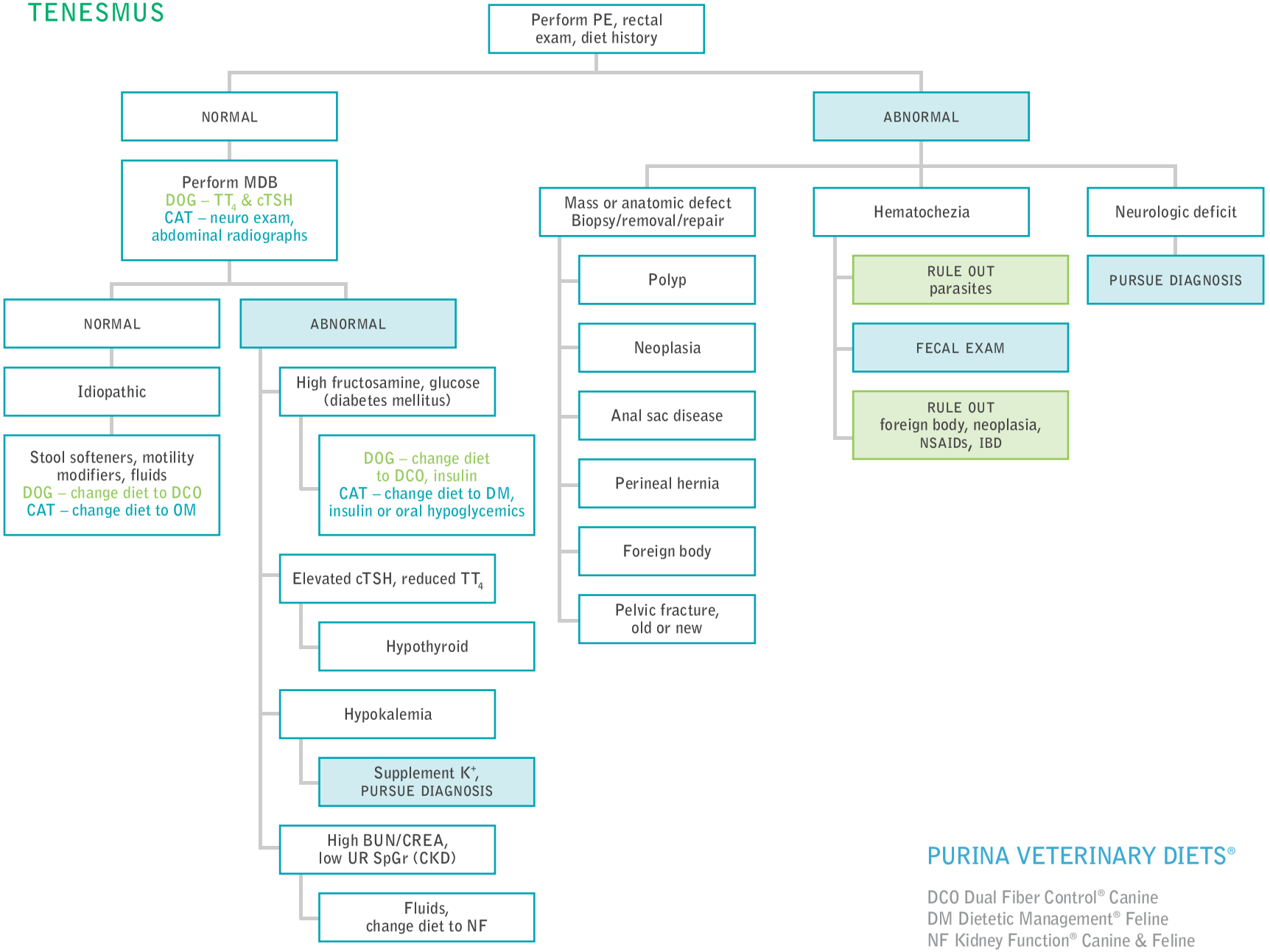
ANOREXIA



*Provide appropriate nutritional support while pursuing diagnosis.

CONSTIPATION
TENESMUS



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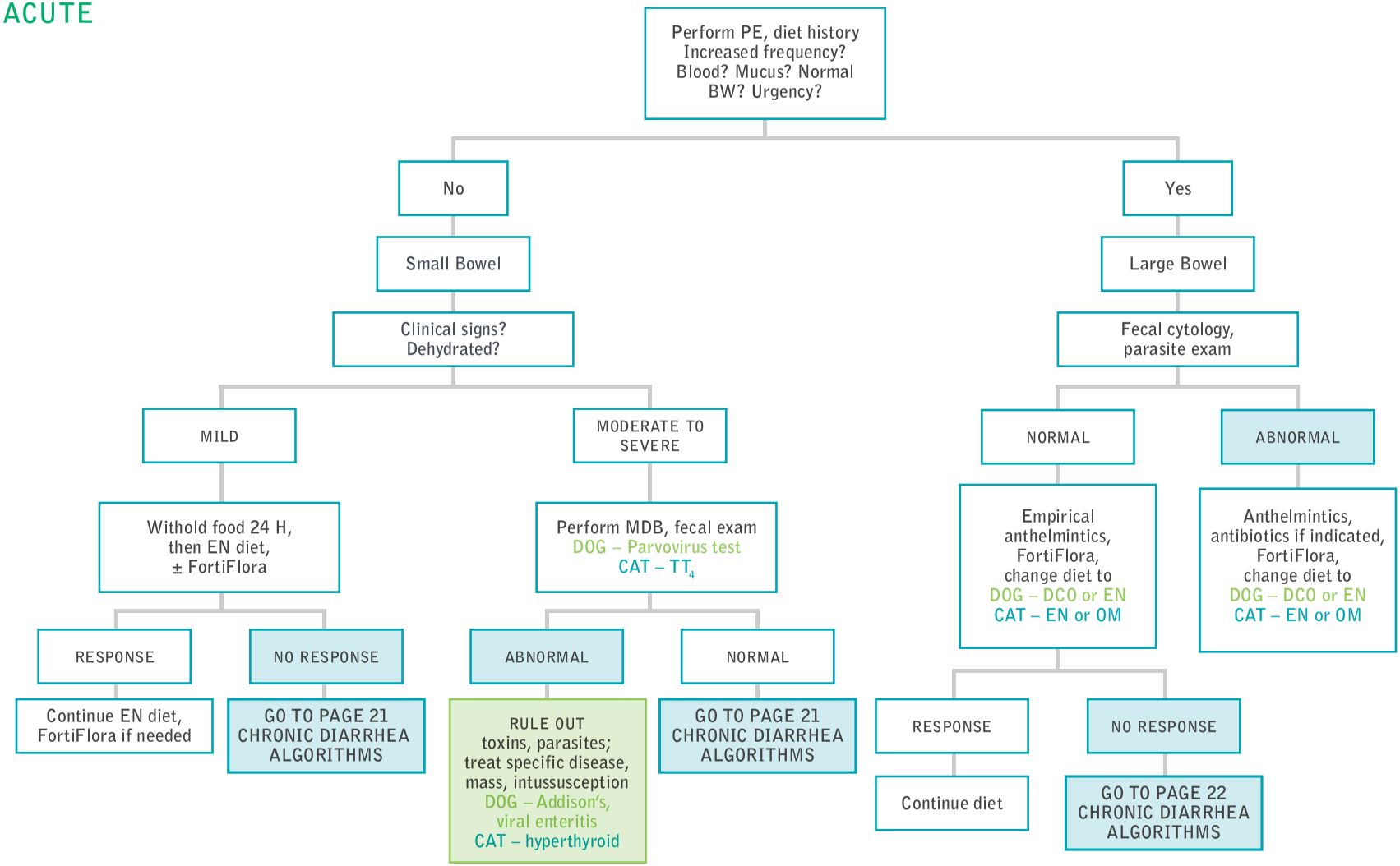
DM Dietetic Management® Feline
NF Kidney Function® Canine & Feline
OM Overweight Management® Canine & Feline

DIARRHEA*
ACUTE



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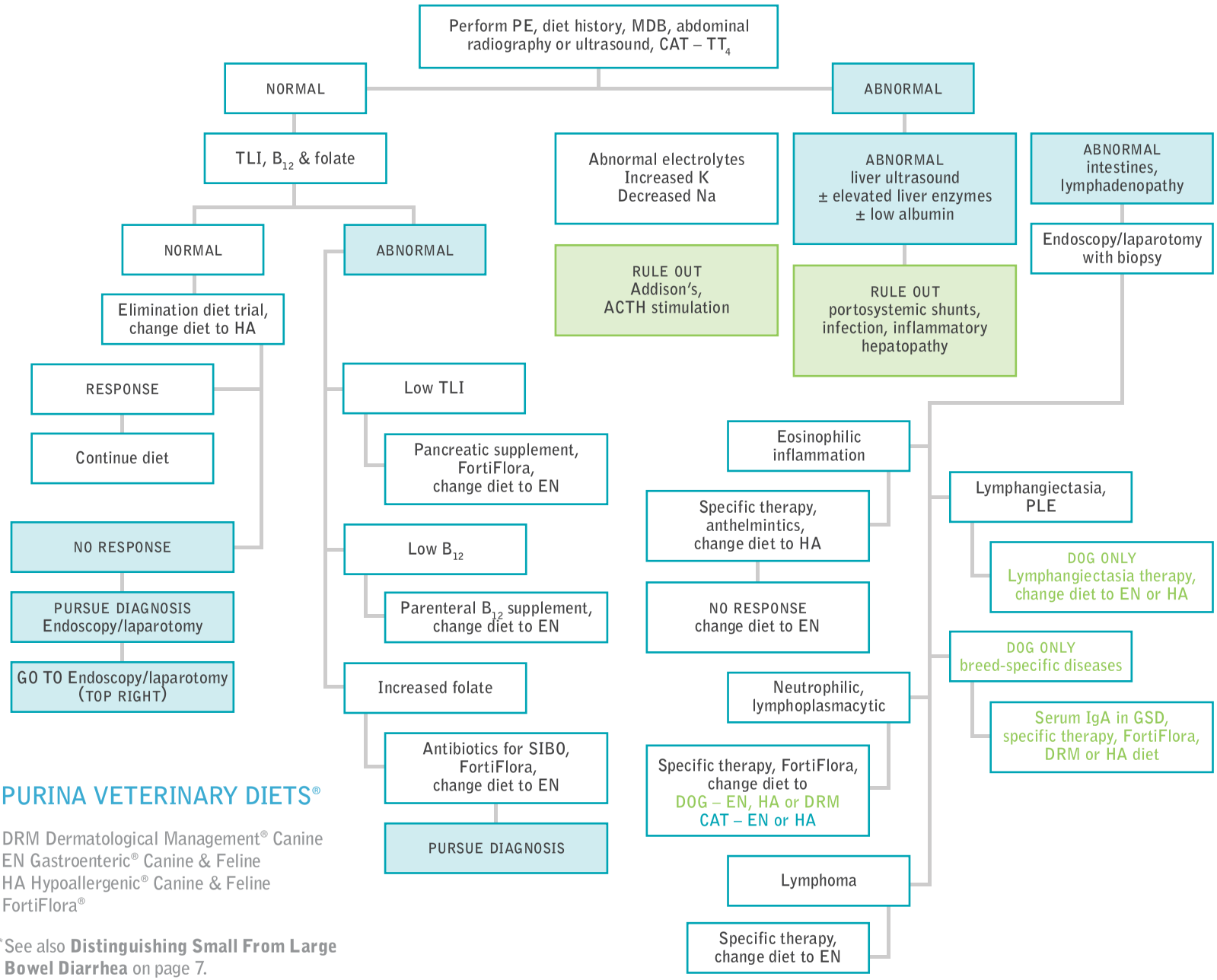
EN Gastroenteric® Canine & Feline
OM Overweight Management® Canine & Feline
FortiFlora®

*See also **Distinguishing Small From Large Bowel Diarrhea** on page 7.

DIARRHEA*
CHRONIC SMALL BOWEL

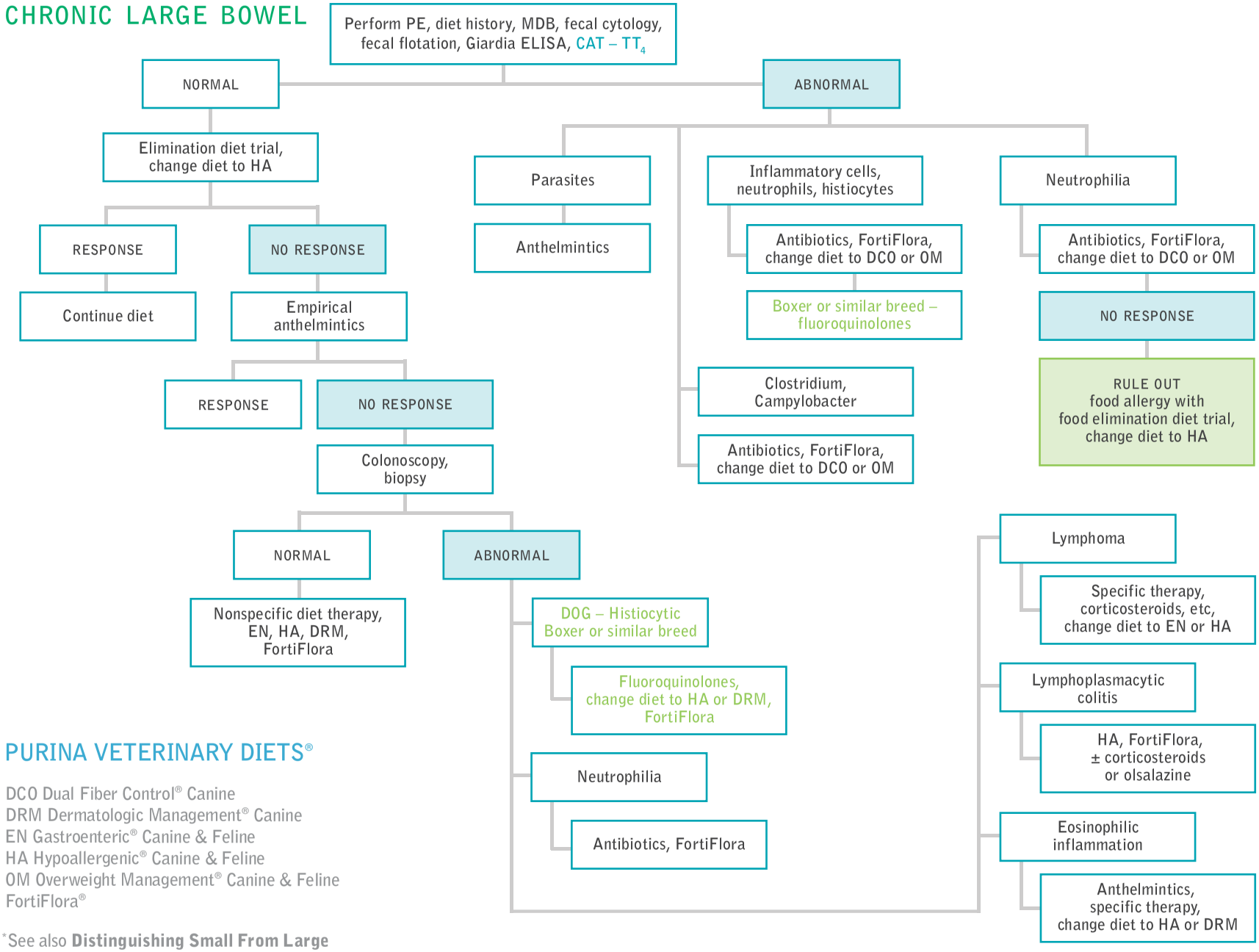


PURINA VETERINARY DIETS®

DRM Dermatological Management® Canine
EN Gastroenteric® Canine & Feline
HA Hypoallergenic® Canine & Feline
FortiFlora®

*See also **Distinguishing Small From Large Bowel Diarrhea** on page 7.

DIARRHEA*
CHRONIC LARGE BOWEL



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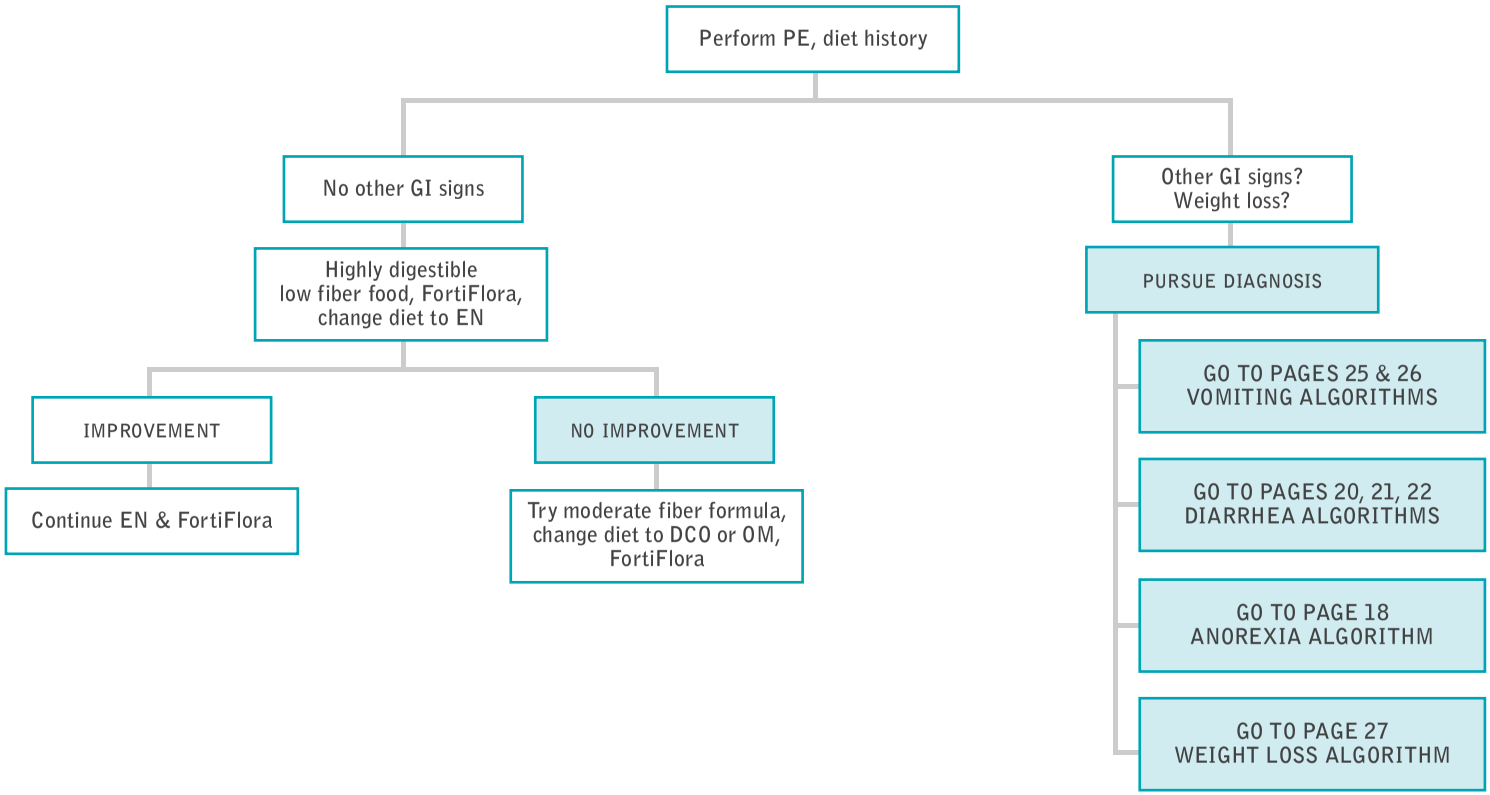
DRM Dermatologic Management® Canine
EN Gastroenteric® Canine & Feline
HA Hypoallergenic® Canine & Feline
OM Overweight Management® Canine & Feline
FortiFlora®

*See also **Distinguishing Small From Large Bowel Diarrhea** on page 7.

FLATULENCE / BORBORYGMUS
CHRONIC



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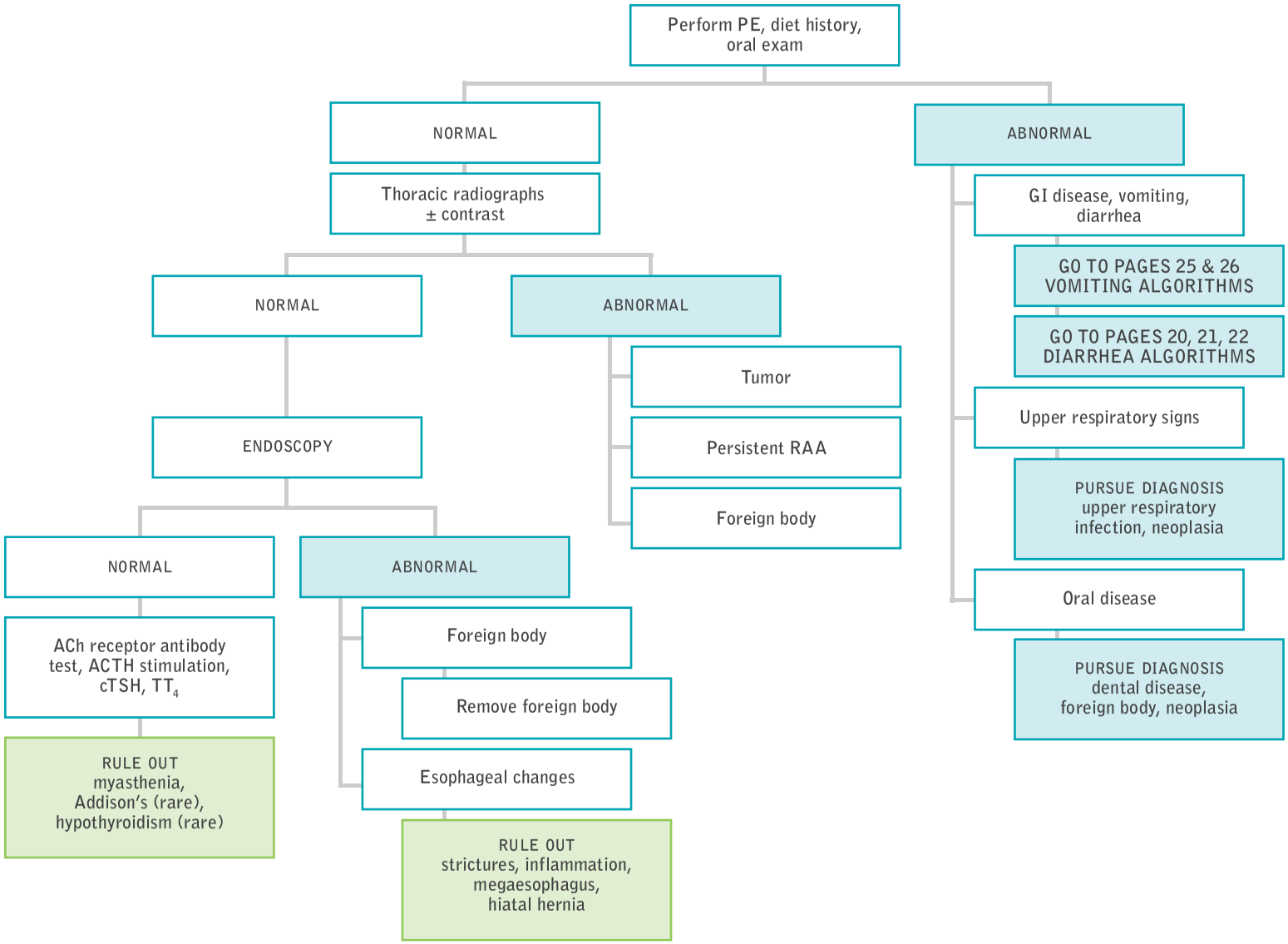
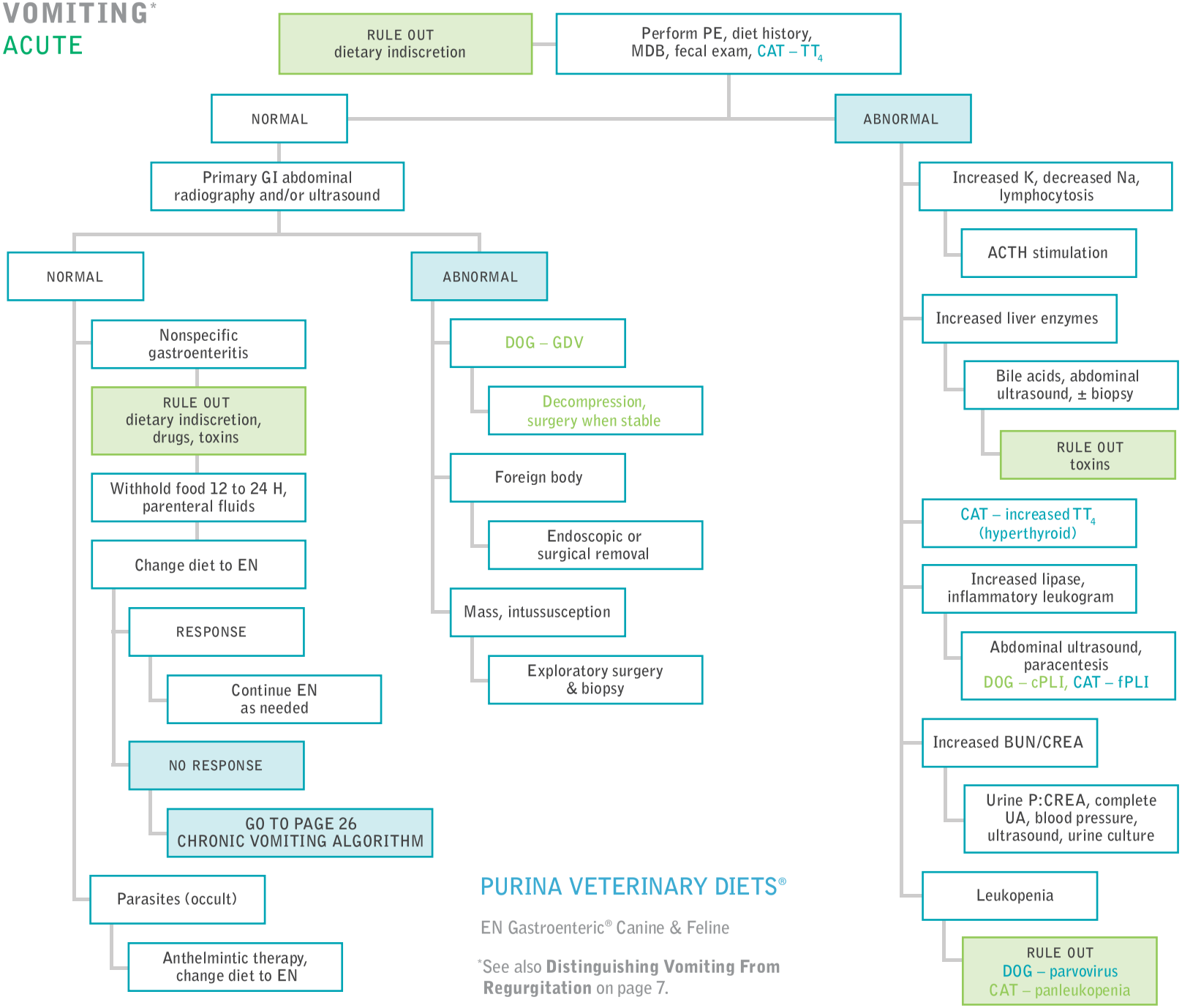
REGURGITATION*
DYSPHAGIA



*See also **Distinguishing Vomiting From Regurgitation** on page 7.

VOMITING*
ACUTE

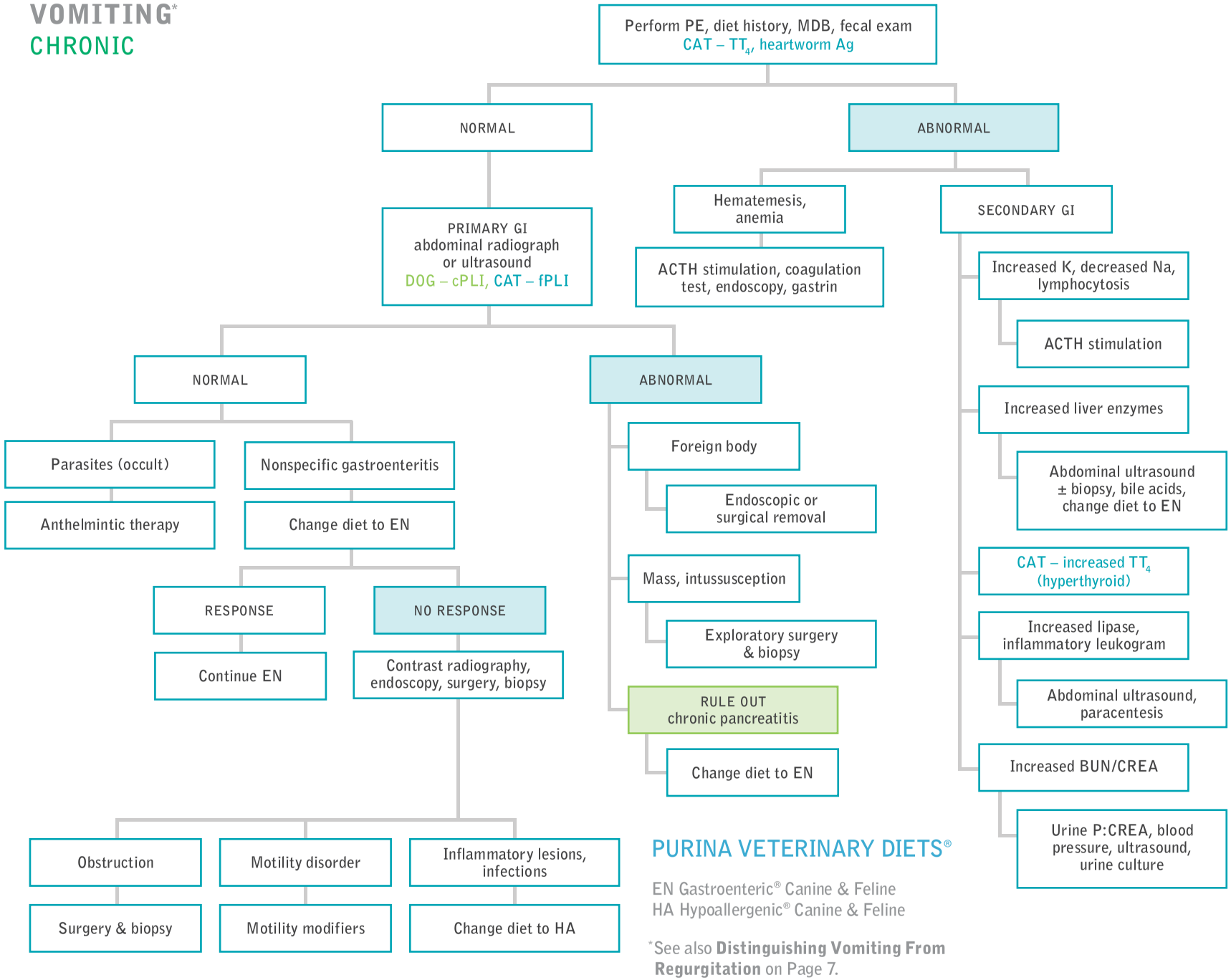


PURINA VETERINARY DIETS®

EN Gastroenteric® Canine & Feline

*See also **Distinguishing Vomiting From Regurgitation** on page 7.

VOMITING*
CHRONIC

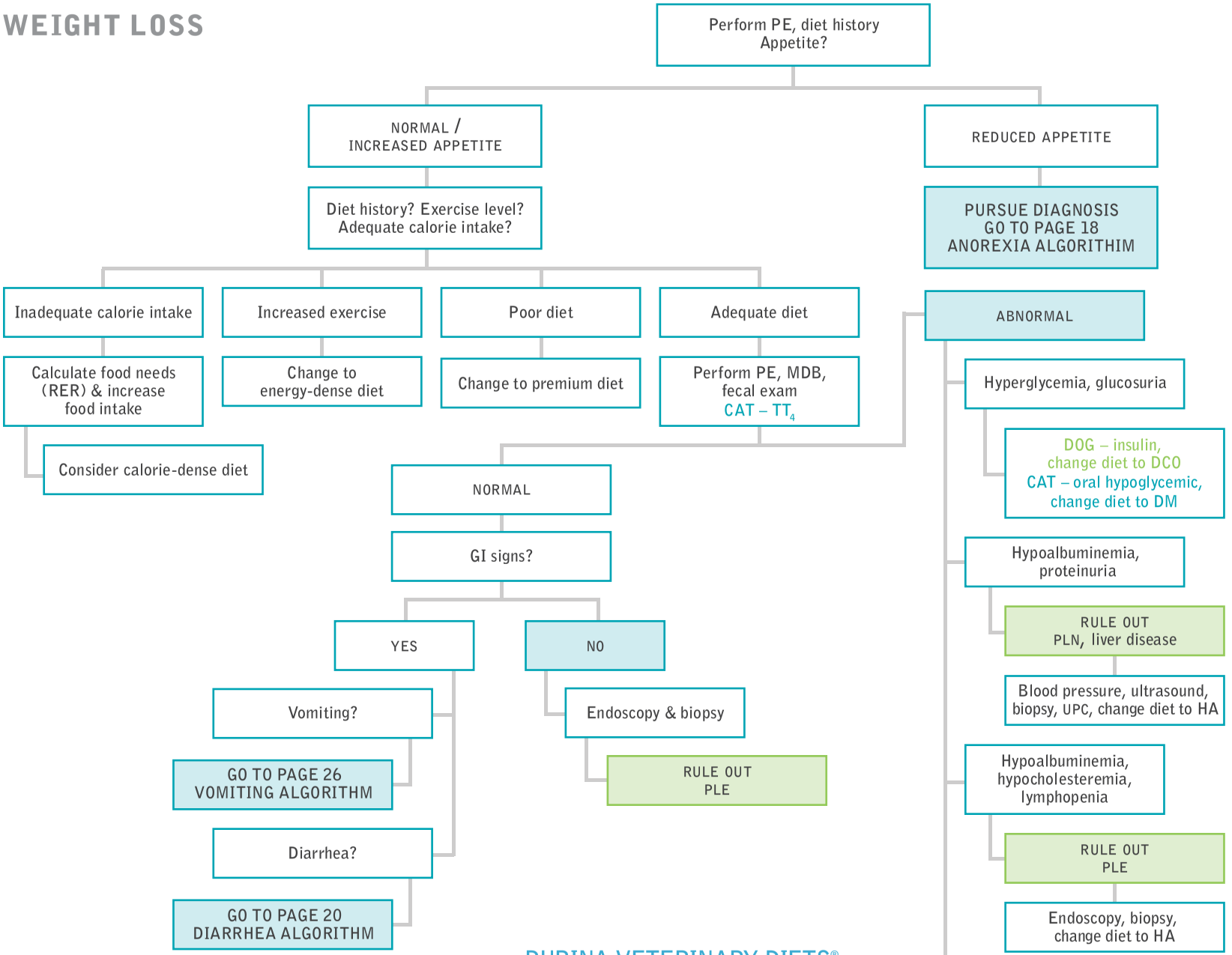


PURINA VETERINARY DIETS®

EN Gastroenteric® Canine & Feline
HA Hypoallergenic® Canine & Feline

*See also **Distinguishing Vomiting From Regurgitation** on Page 7.

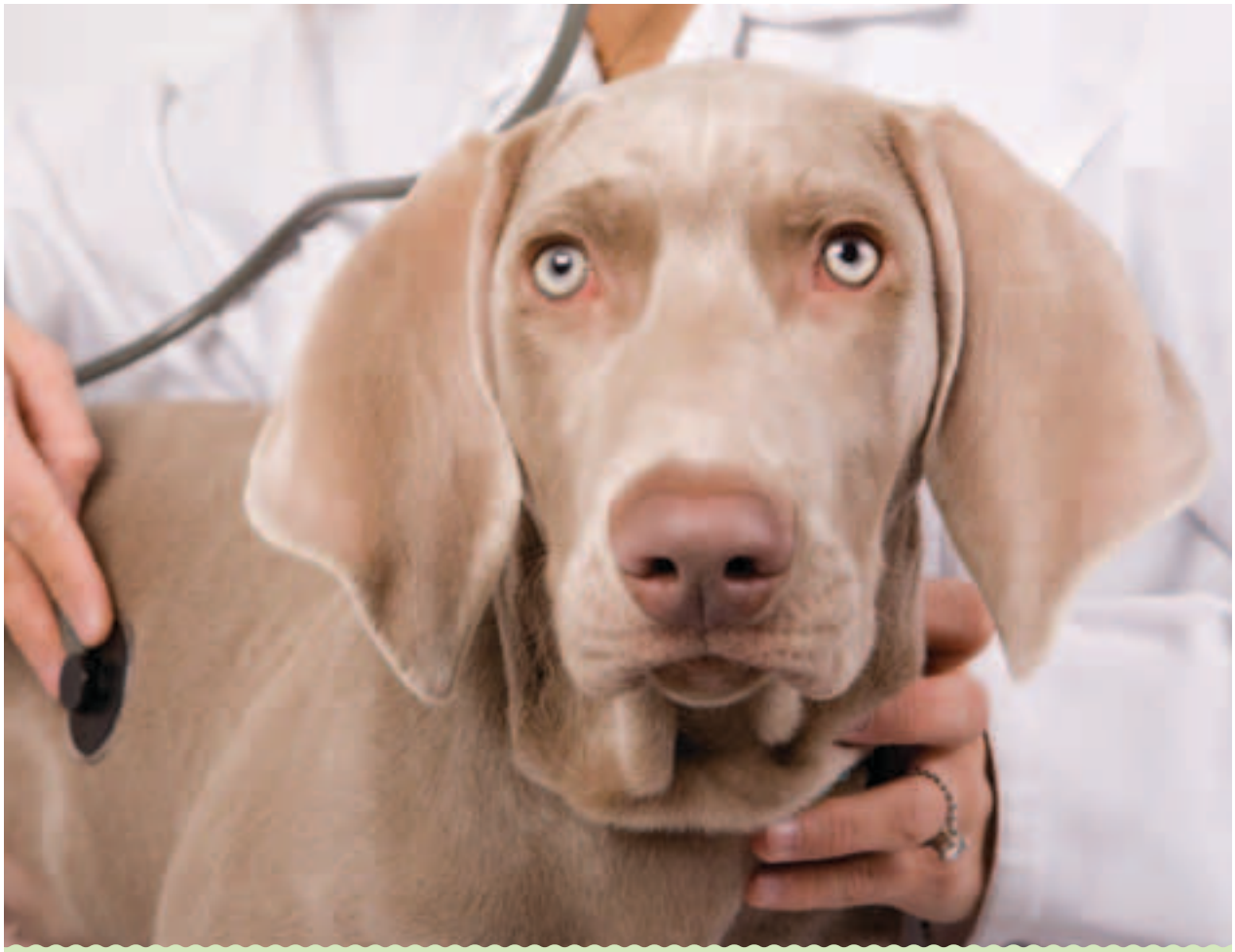
WEIGHT LOSS



PURINA VETERINARY DIETS®

DCO Dual Fiber Control® Canine
DM Dietary Management® Feline

Purina Veterinary Diets® for GI Support



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COMBINED CANINE & FELINE

DCO Dual Fiber Control® Canine Formula

CLINICAL CONSIDERATIONS

The role of dietary management in canine diabetes mellitus and colitis is to provide a proper balance of total nutrients while meeting the special dietary needs of the patient. Complex carbohydrates and dietary fiber help to delay the absorption of glucose from the intestinal tract and minimize postprandial fluctuation of glucose in dogs with diabetes mellitus. Soluble fiber in the diet may also prolong gastrointestinal transit time, allow greater water absorption and promote the production of short-chain fatty acids, which nourish the intestinal mucosa.

DIET CHARACTERISTICS

- Complete and balanced nutrition for maintenance of adult dogs
- High level of complex carbohydrates
- Targeted urine pH-acid (6.0–6.2)
- Increased fiber, including soluble fiber
- Moderate total dietary fat and calories
- Source of omega-3 and omega-6 fatty acids

MEDICAL INDICATIONS

- Diabetes mellitus
- Constipation
- Fiber-responsive colitis
- Large bowel diarrhea

MEDICAL CONTRAINDICATIONS

- Conditions associated with catabolic states

DM Dietetic Management® Feline Formula

CLINICAL CONSIDERATIONS

The role of dietary management in feline diabetes mellitus is to provide a proper balance of nutrients while meeting the special dietary needs of the patient. Cats are unique in their requirement to metabolize high concentrations of dietary protein. A high percentage of protein is used for gluconeogenesis. The increased concentration of high-quality protein in this diet provides the cat's essential amino acid requirements and a substrate for glucose production. With glucose production from dietary amino acids, the carbohydrate content of the diet may be dramatically reduced, as with this formulation. Glucose derived from hepatic gluconeogenesis is delivered to the bloodstream at a slower rate compared to the release of glucose from digestion of dietary carbohydrate. The result is a more consistent, steady release of glucose and the potential for reduced insulin requirements.

DIET CHARACTERISTICS

- Complete and balanced nutrition for the adult cat
- High protein
- Source of omega-3 and omega-6 fatty acids
- Low carbohydrate
- High level of antioxidants

MEDICAL INDICATIONS

- Diabetes mellitus
- Persistent hyperglycemia
- Critical care management of cats and dogs
- Enteritis, diarrhea

MEDICAL CONTRAINDICATIONS

- Renal failure
- Hepatic encephalopathy

EN Gastroenteric® Canine Formula

CLINICAL CONSIDERATIONS

The role of dietary management in canine gastrointestinal conditions is to provide a proper balance of total nutrients while meeting the special dietary needs of the patient. Dietary fats from long-chain triglycerides (LCTs) can be one of the most complex nutrients to digest, and fermentation of undigested fats can contribute to diarrhea. Medium-chain triglycerides (MCTs) provide a readily digested and utilized energy source. Feeding a properly formulated diet designed to be highly digestible yet restricted in long-chain triglycerides may be beneficial in the management of certain gastrointestinal conditions while meeting the nutritional needs of the animal.

DIET CHARACTERISTICS

- Complete and balanced nutrition for growth of puppies and maintenance of adult dogs
- High digestibility
- Moderate fat
- Source of omega-3 and omega-6 fatty acids
- Low fiber
- Increased antioxidant vitamins E and C
- Added zinc
- Source of MCTs (22% to 34% of fat)

MEDICAL INDICATIONS

- Enteritis, gastritis and diarrhea
- Pancreatitis
- Exocrine pancreatic insufficiency (EPI)
- Hyperlipidemia
- Inflammatory bowel disease (IBD)
- Malabsorption and maldigestion
- Lymphangiectasia
- Hepatic disease not associated with encephalopathy

MEDICAL CONTRAINDICATIONS

- None

EN Gastroenteric® Feline Formula

CLINICAL CONSIDERATIONS

The role of dietary management in feline gastrointestinal conditions is to provide a proper balance of total nutrients while meeting the special dietary needs of the patient. Some cats with diarrhea are sensitive to dietary carbohydrates. Feeding a high-quality diet that is high in protein and low in carbohydrates provides optimal nutrition for these cats with compromised gastrointestinal tracts. With added B vitamins, easily absorbed chelated minerals and high fat content, EN provides the nutrients needed to help support cats with GI tract problems.

DIET CHARACTERISTICS

- Complete and balanced nutrition for growth of kittens and maintenance of adult cats
- Low carbohydrate
- Added B vitamins
- High protein
- Exceptional palatability
- Chelated minerals (copper, zinc, manganese)
- Moderate fat

MEDICAL INDICATIONS

- Enteritis
- Gastritis
- Diarrhea
- Vomiting
- Hepatic lipidosis

MEDICAL CONTRAINDICATIONS

- Renal failure
- Hepatic encephalopathy

HA Hypoallergenic® Canine Formula

CLINICAL CONSIDERATIONS

The role of dietary management in canine food allergy is to provide a proper balance of total nutrients while meeting the special dietary needs of the patient. Most common food allergens are proteins with a molecular weight of 18,000 to 70,000 daltons. Protein modification is a process that alters the physical characteristics of protein molecules, reducing the antigenicity and rendering them less able to elicit an immune response. By reducing the molecular weight of the protein molecule below 18,000 daltons, this process can result in a protein that is truly hypoallergenic.

DIET CHARACTERISTICS

- Complete and balanced nutrition for growth of puppies and maintenance of adult dogs
- Hydrolyzed protein source (average molecular weight below 12,200 daltons)
- Single protein source
- Source of medium-chain triglycerides (MCTs), 23% of fat
- High digestibility
- Vegetarian diet
- Low-allergen carbohydrate source

MEDICAL INDICATIONS

- Elimination diet for food trials
- Dermatitis associated with food allergy
- Pancreatitis
- Gastroenteritis associated with food allergy
- Exocrine pancreatic insufficiency (EPI)
- Protein-losing enteropathy (PLE)
- Inflammatory bowel disease (IBD)
- Lymphangiectasia
- Malabsorption
- Hyperlipidemia

MEDICAL CONTRAINDICATIONS

- None

HA Hypoallergenic® Feline Formula

CLINICAL CONSIDERATIONS

The role of dietary management in feline food allergy is to provide a proper balance of total nutrients while meeting the special dietary needs of the patient. Most common food allergens are proteins with a molecular weight of 18,000 to 70,000 daltons. Protein hydrolysis is a process that reduces the protein size to small polypeptides, reducing the antigenicity and rendering them less able to elicit an immune response. By reducing the molecular weight of the protein molecule below 18,000 daltons, this process can result in a protein that is truly hypoallergenic.

DIET CHARACTERISTICS

- Complete and balanced nutrition for growth of kittens and maintenance of adult cats
- Hydrolyzed protein with a low molecular weight
- Low allergen carbohydrate source
- High digestibility

MEDICAL INDICATIONS

- Elimination diet for food trials
- Gastroenteritis associated with food allergy
- Food intolerance
- Dermatitis associated with food allergy
- Chronic nonspecific diarrhea and vomiting
- Inflammatory bowel disease (IBD)

MEDICAL CONTRAINDICATIONS

- None

NF Kidney Function® Canine Formula

CLINICAL CONSIDERATIONS

The role of dietary management in canine kidney conditions is to provide a proper balance of total nutrients while meeting the special dietary needs of the patient. Low phosphorus intake helps to protect against hyperphosphatemia and associated renal damage. Restricted but high-quality protein in the diet minimizes the intake of nonessential amino acids. This helps decrease the production of nitrogenous waste products. Reduced levels of sodium help compensate for the diseased kidney's inability to regulate this important mineral. Increased omega-3 fatty acids may help reduce glomerular hypertension.

DIET CHARACTERISTICS

- Complete and balanced nutrition for maintenance of adult dogs
- Low phosphorus
- Reduced protein
- Added potassium
- Reduced sodium
- Target urine pH-alkaline (6.7–7.5)
- Source of omega-3 and omega-6 fatty acids

MEDICAL INDICATIONS

- Renal failure
- Calcium oxalate urolithiasis
- Early stages of congestive heart failure
- Hepatic disease associated with encephalopathy

MEDICAL CONTRAINDICATIONS

Conditions that require high protein or phosphorus intake

NF Kidney Function® Feline Formula

CLINICAL CONSIDERATIONS

The role of dietary management in feline kidney conditions is to provide an appropriate balance of total nutrients while meeting the special dietary needs of the patient. Low phosphorus intake helps to protect against hyperphosphatemia and the associated renal damage. Restricted but high-quality protein in the diet minimizes the intake of nonessential amino acids. This helps decrease the production of nitrogenous waste products. Reduced levels of sodium help compensate for the diseased kidney's inability to regulate this important mineral. Increased omega-3 fatty acids may help reduce glomerular hypertension.

DIET CHARACTERISTICS

- Complete and balanced nutrition for maintenance of adult cats
- Low phosphorus
- Reduced sodium
- Source of omega-3 and omega-6 fatty acids
- Target urine pH-alkaline (6.7–7.5)
- Added potassium
- Reduced protein
- Added B-complex vitamins

MEDICAL INDICATIONS

- Renal failure
- Hepatic disease associated with encephalopathy
- Early stages of congestive heart failure

MEDICAL CONTRAINDICATIONS

- Conditions that require high protein or phosphorus intake

OM Overweight Managment® Canine Formula

CLINICAL CONSIDERATIONS

The role of dietary management in canine obesity is to reduce calorie intake sufficiently to induce weight loss, while providing a proper balance of total nutrients. A low fat diet can be helpful in controlling calorie intake. Dietary crude fiber helps reduce the amount of available calories and contributes to satiety. Increased dietary protein increases metabolic activity and may promote satiety. In addition, an increased protein:calorie ratio promotes loss of body fat while helping to minimize the loss of lean body mass during weight loss. Obese animals experience an increase in oxidative stress. Isoflavones have been shown to reduce oxidative stress in overweight dogs. Isoflavones also aid in weight maintenance by helping to reduce weight rebound and the associated accumulation of fat. Feeding a diet that is low in calories, high in protein and fiber, and that contains isoflavones, may be beneficial in the management of obesity while meeting the nutritional needs of the animal.

DIET CHARACTERISTICS

- Complete and balanced nutrition for weight loss and weight maintenance of adult dogs
- Low fat
- Low calorie
- High fiber
- High protein:calorie ratio
- Target urine pH-acid (6.2–6.4)
- Contains a source of isoflavones (dry)

MEDICAL INDICATIONS

- Fiber-responsive colitis
- Hyperlipidemia in overweight dogs
- Neutered/spayed dogs
- Diabetes mellitus in overweight dogs
- Constipation
- Obesity

MEDICAL CONTRAINDICATIONS

- Conditions associated with catabolic states

OM Overweight Managment® Feline Formula

CLINICAL CONSIDERATIONS

The role of dietary management in feline obesity is to provide a proper balance of total nutrients while meeting the special dietary needs of the patient. Dietary fats contribute more than twice the available energy compared to carbohydrates and protein. A low fat diet can be helpful in controlling calorie intake. Dietary crude fiber is poorly digested and helps reduce the amount of available calories and may contribute to satiety. Increased dietary protein may promote both increased metabolic activity and satiety. In addition, an increased protein:calorie ratio promotes loss of body fat while helping to minimize the loss of lean body mass during weight loss. Feeding a properly formulated diet designed to be restricted in calories, and high in fiber and protein, may be beneficial in the management of obesity while meeting the nutritional needs of the animal.

DIET CHARACTERISTICS

- Complete and balanced nutrition for weight loss and weight maintenance of adult cats
- Low fat
- Promotes acidic urine
- Low calorie
- High fiber
- High protein:calorie ratio

MEDICAL INDICATIONS

- Obesity
- Fiber-responsive colitis
- Diabetes mellitus in overweight cats
- Hyperlipidemia in overweight cats
- Constipation
- Hairballs

MEDICAL CONTRAINDICATIONS

- Conditions associated with catabolic states

DRM Dermatologic Managment® Canine Formula

CLINICAL CONSIDERATIONS

The role of dietary management in canine atopy, dermatitis and other inflammatory skin conditions is to provide a proper balance of total nutrients while meeting the special dietary needs of the patient. Nutritional management of dermatitis involves providing nutrients that can support healthy skin and help to reduce the production of inflammatory mediators. Essential fatty acids, key vitamins and amino acids, and trace minerals such as zinc are critical to healthy skin. Long chain omega-3 fatty acids have been shown to reduce the inflammation and clinical signs associated with atopy and allergic dermatitis, so may be beneficial in these and other inflammatory skin conditions. A diet with novel protein ingredients may also help in the management of dogs with food allergies.

DIET CHARACTERISTICS

- Complete and balanced nutrition for growth of puppies and maintenance of adult dogs
- High omega-3 fatty acid content
- Appropriate levels of omega-6 fatty acids
- Increased antioxidant vitamins A, E and beta-carotene
- Added zinc
- Limited number of novel protein ingredients

MEDICAL INDICATIONS

- Atopy
- Food allergy dermatitis
- Other inflammatory skin conditions
- Pruritus

MEDICAL CONTRAINDICATIONS

- Allergies to listed ingredients

FortiFlora® Nutritional Supplement

CLINICAL CONSIDERATIONS

Gastrointestinal tract conditions such as diarrhea are commonly seen in dogs and cats and are often associated with an imbalance in the intestinal microflora. Restoring microflora balance is a key component of the effective management of these conditions. FortiFlora is a nutritional supplement that contains a probiotic, *Enterococcus faecium* strain SF68, for the dietary management of dogs and cats with diarrhea. This probiotic has been shown to be safe, stable and effective in restoring normal intestinal health and balance.

DIET CHARACTERISTICS

- Contains a guaranteed level of viable microorganisms
- Proprietary microencapsulation process for enhanced stability
- Proven to promote normal intestinal microflora
- Promotes a strong immune system
- Shown to be safe for use in dogs and cats
- Contains high levels of antioxidant vitamins A, E and C
- Excellent palatability

MEDICAL INDICATIONS

- Diarrhea associated with microflora imbalance
- Diarrhea associated with stress, antibiotic therapy and diet change
- Acute enteritis
- Poor fecal quality in puppies and kittens
- Compromised strong immune system

MEDICAL CONTRAINDICATIONS

- Dogs and cats with food allergies
- Severely immune-compromised dogs and cats

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