#### ABSTRACT

**Objective:** The purpose of this study was to correlate clinical signs with the region of the pancreas affected as based on ultrasound findings with the hypothesis that left-sided pancreatitis would result in a greater percentage of anorexia and right-sided pancreatitis would result in a greater percentage of vomiting.

**Methods:** The records of 54 privately owned dogs that were diagnosed with acute pancreatitis based on history, clinical signs, laboratory testing, and abdominal ultrasonography were retrospectively evaluated. Based on the ultrasound examination, the dogs were divided into two groups: Group 1 consisted of 24 dogs diagnosed with pathology within the left limb of the pancreas and group 2 consisted of 30 dogs that were diagnosed with pathology within the right limb of the pancreas. The presence of abdominal pain, anorexia, vomiting, and diarrhea was correlated between the two groups.

**Results:** There was no difference between age, breed and sex of dogs in each group, and in both groups, small breeds were over-represented. In group 1, pain was noted in 36% of the dogs, anorexia in 48% of the dogs, vomiting in 17% of the dogs, and diarrhea in 20% of the dogs. In group 2, pain was noted in 37% of the dogs, anorexia in 30% of the dogs, vomiting in 73% of the dogs, and diarrhea in 8% of the dogs. A statistical difference between the groups was present with vomiting and diarrhea.

**Conclusion:** These findings indicate that there is a clinical difference between rightand left-sided pancreatitis, with diarrhea statistically significant in left-sided pancreatitis and vomiting statistically significant in right-sided pancreatitis. These differences between the two groups can possibly be ascribed to duodenal and upper gastro-intestinal tract involvement when the right side of the pancreas is affected, resulting in vomiting rather than diarrhea.

### INTRODUCTION

Pancreatitis is a relatively common disorder in dogs, and its diagnosis is clinically challenging. Depending on disease severity, clinical presentation can vary markedly and may consist of non-specific findings such as anorexia, vomiting, lethargy, diarrhea, abdominal pain, and weight loss. However, this combination of clinical signs can occur in other conditions.<sup>1,2</sup>

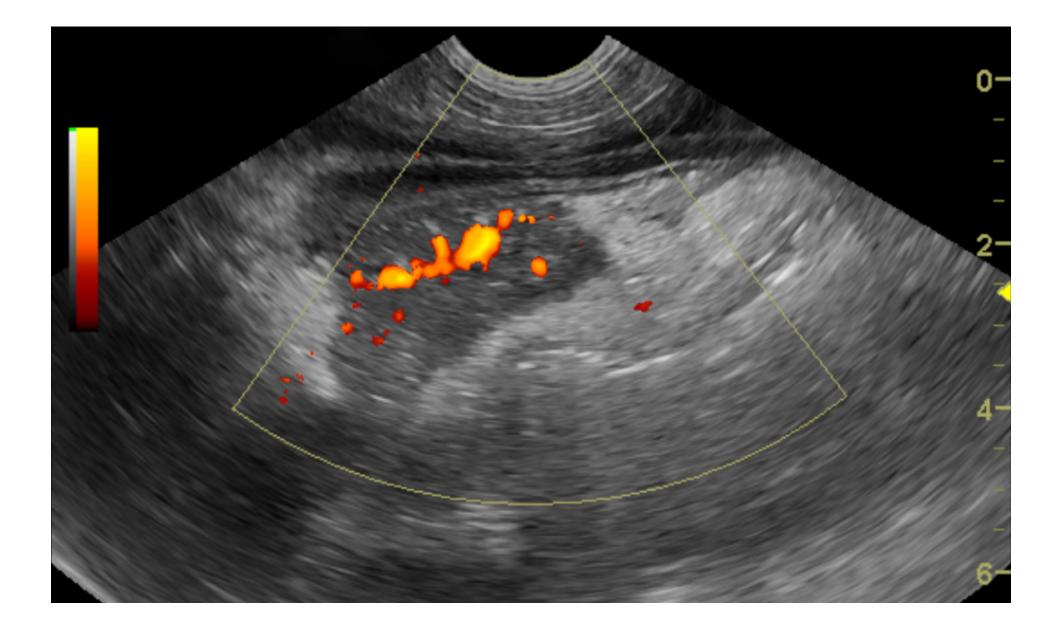
The diagnosis of acute pancreatitis can be difficult because of the anatomic inaccessibility of the pancreas, vague clinical signs and physical examination findings, and inconsistent laboratory results. Common, yet non-specific, clinical signs include abdominal pain, anorexia, vomiting, and diarrhea. Controversy exists regarding the sensitivity and specificity of diagnostic tests for the diagnosis of pancreatitis. Part of this confusion arises from the fact that there is no easily applied gold standard against which diagnostic methods can be evaluated. A definitive diagnosis of pancreatitis requires histopathology confirmation, but because of the invasiveness of pancreatic biopsy, and the possibility of highly localized disease that can be missed with a single biopsy, this procedure is infrequently performed.<sup>3</sup> Although serum amylase and lipase activities are useful as a quick screening test for pancreatitis, their activity must be at least three to five times the upper limit of the reference range to suggest a diagnosis of pancreatitis.<sup>2</sup> Furthermore, the diagnosis must be confirmed by other diagnostic modalities, and normal test results do not eliminate the possibility of pancreatitis. Serum specific pancreatitic lipase is a highly specific test for exocrine pancreatic function and is also highly sensitive for pancreatitis.<sup>4.5</sup> Abdominal ultrasound is highly specific for pancreatitis but is not particularly sensitive.<sup>2</sup> Histopathology evidence of pancreatitis is conclusive for a diagnosis of pancreatitis, however, in most cases, lesions are localized, and the lack of histopathology evidence of pancreatitis does not eliminate a diagnosis of pancreatitis.

Thus, the diagnosis of pancreatitis generally is clinical and based on a combination of clinicopathologic and imaging findings. Currently, ultrasonography is the imaging modality of choice to evaluate the pancreas and to differentiate from other intra-abdominal pathology that may mimic acute pancreatitis. Considering laboratory work, serum specific pancreatitic lipase currently is regarded as the most sensitive and specific test for diagnosing pancreatitis and usually is accepted as a biochemical surrogate marker for the disease in clinical practice.

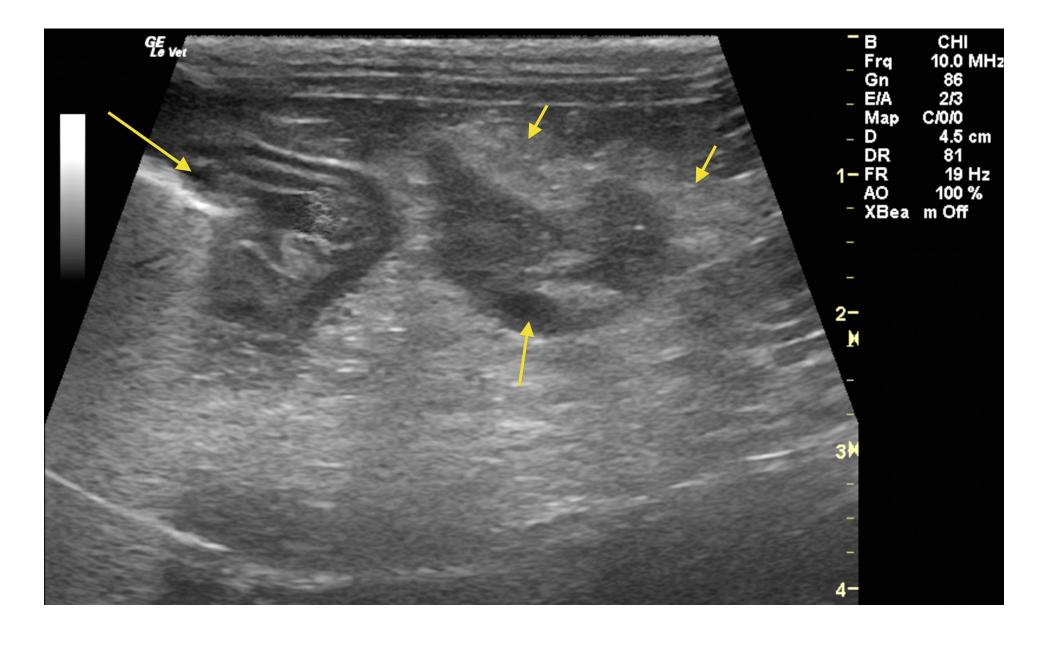
## Pancreatic Ultrasound in 54 Dogs with Acute Pancreatitis: Different Clinical Presentation with Left or Right Limb Involvement of the Pancreas

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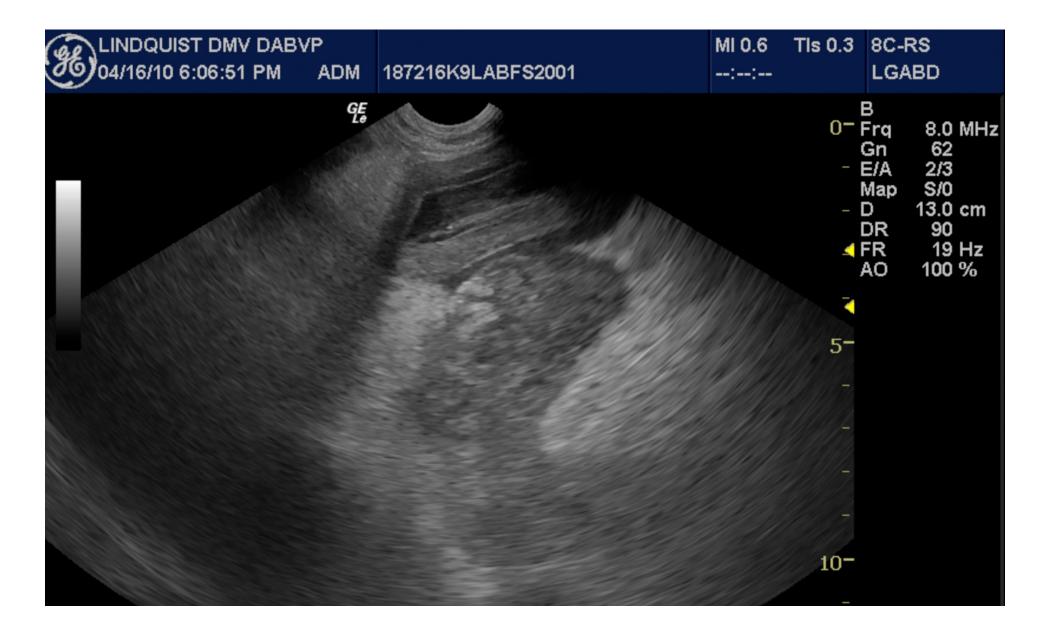
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### Right limb pancreatitis with power Doppler

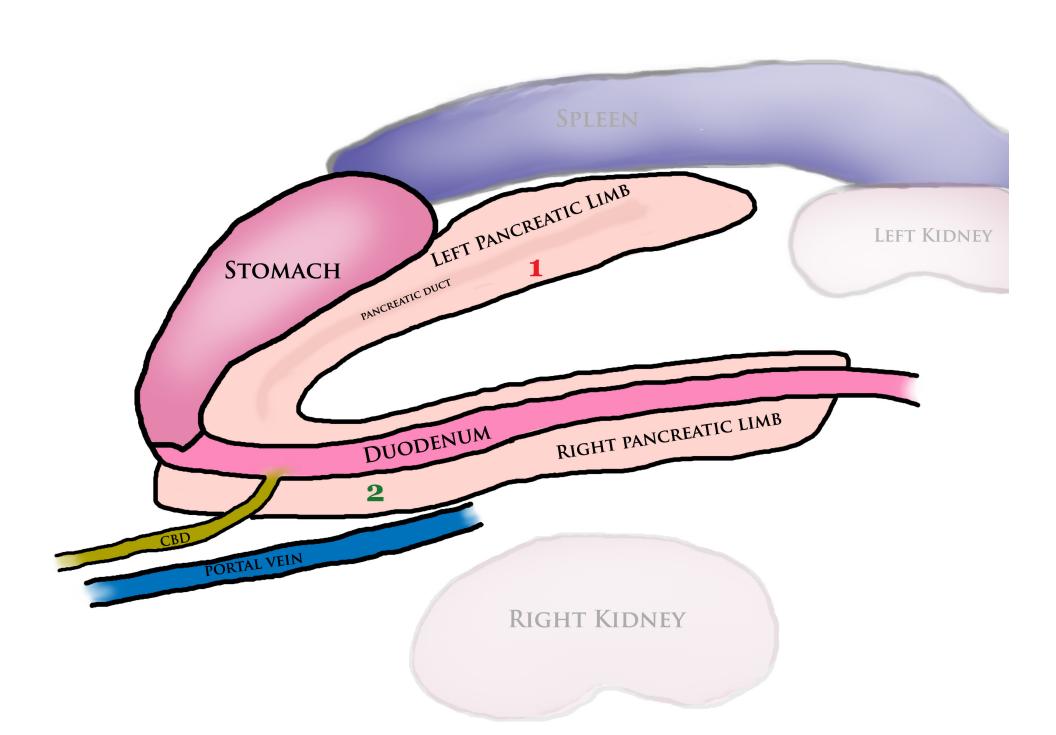


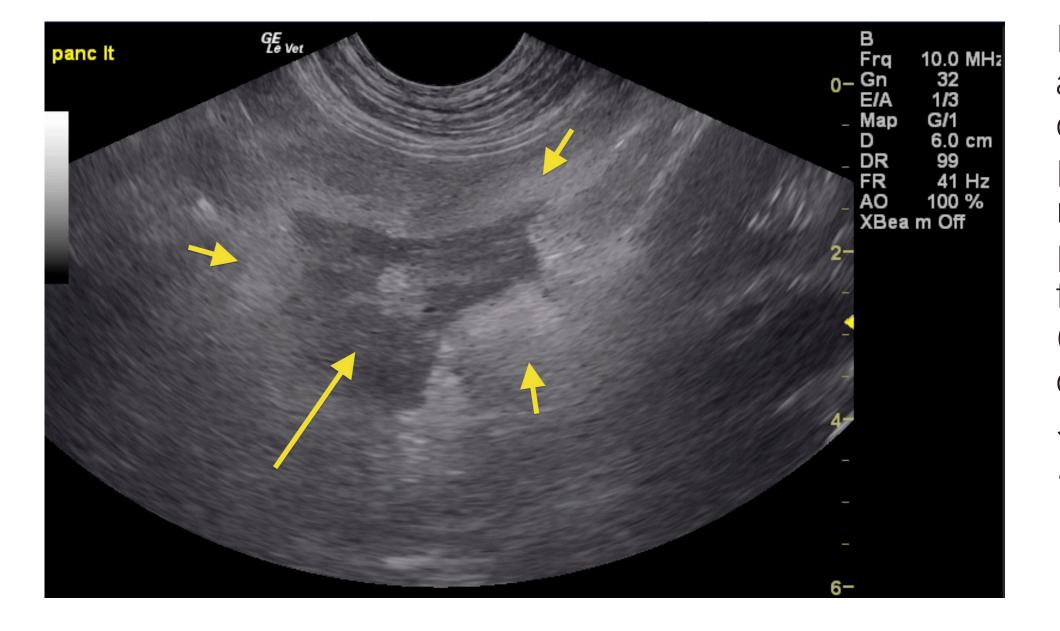
mage 2: Example of pancreatitis affecting the left limb of the pancreas (Group 1): Focal mixed hypoechoic lesion (middle arrow) in the near field at the base of the left pancreatic limb. Low-grade illdefined inflamed fat (small arrows) is noted bordering the hypoechoic pancreatic parenchyma typical of pancreatitis. The location is caudal to the gastric fundus (long arrow) free from influence upon the duodenum or pyloric outflow. Image courtesy of Doug Casey DMV, DAB-VP English Bay Ultrasound, Vancouver, BC, Canada.



**Image 4:** Example of pancreatitis affecting the **right limb** of the pancreas (**Group 2**): Hypoechoic edematous pancreatic parenchyma and hyperechoic ill-defined surrounding fat consistent with saponification and inflamed mesentery. The upper descending duodenum in the near field is mildly edematous and adjacent to the pancreatic inflammation.

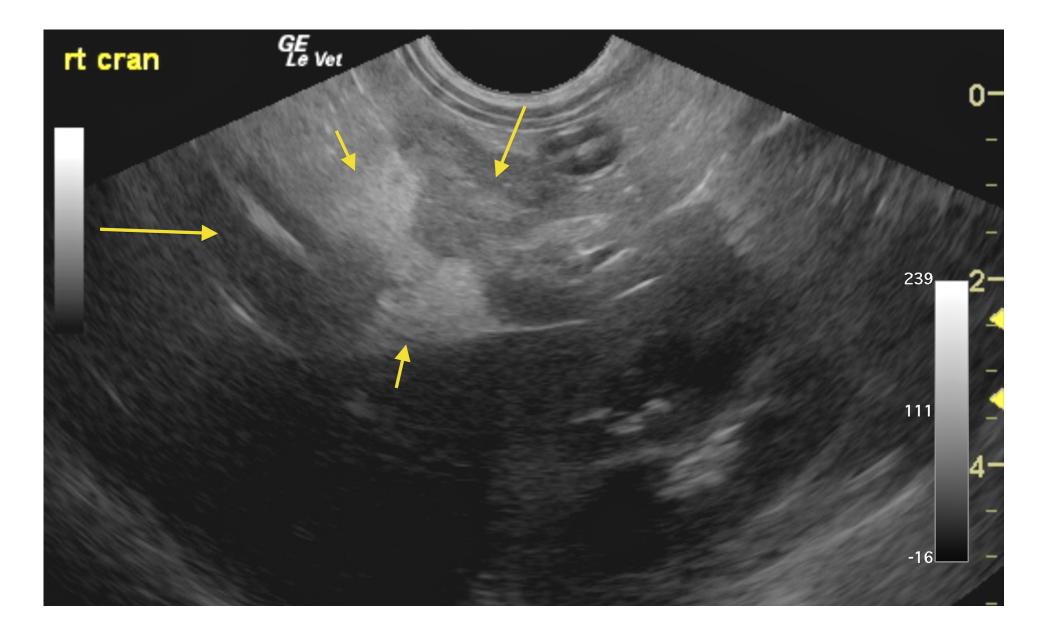




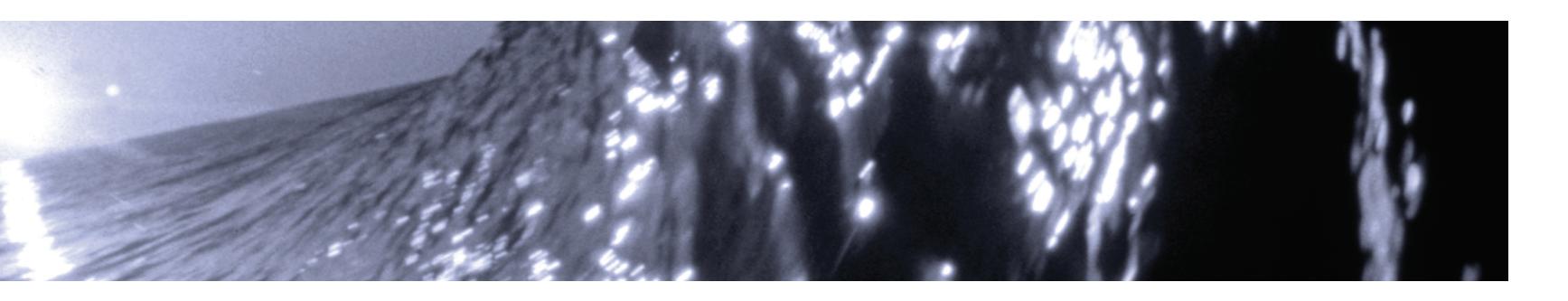


**Image 1:** Diagram of the pancreatic structure and contour. The left limb extends caudally from the gastric fundus and is located medial to the spleen in an open space of the left cranial abdomen. Pancreatitis lesions in category 1 were isolated in this region without involvement of region 2. The right limb and right base encases the pyloric outflow and upper descending duodenum allowing for contiguous insult to the upper GI tract when pancreatic pathology is located in this position. Lesions in category 2 were located here. Diagram courtesy of Kelly Vazquez.

**Image 3:** Example of pancreatitis affecting the **left limb** of the pancreas (**Group 1**): Left limb of the pancreas demonstrating coarse mixed hypoechoic (long arrow) pancreatic parenchyma with ill defined hyperechoic surrounding fat (small arrows) typical of acute-onchronic pancreatitis. *Image courtesy of Andi Parkinson Intrapet Imaging, Baltimore, MD, USA.* 



**Image 5:** Example of pancreatitis affecting the **right limb** of the pancreas (**Group 2**): Right limb pancreatitis with mixed hypoechoic edematous parenchyma (middle arrow), ill defined inflamed surrounding fat (short arrows), all of which envelope and irritate the upper descending duodenum (long arrow). Right kidney is present in far field. *Image courtesy of Andi Parkinson Intrapet Imaging, Baltimore, MD, USA.* 



The purpose of this study was to correlate clinical signs with the region of the pancreas affected as based on ultrasound findings with the hypothesis that left-sided pancreatitis would result in a greater percentage of anorexia and right-sided pancreatitis would result in a greater percentage of vomiting.

### **MATERIALS AND METHODS**

The records of 54 privately owned dogs that were diagnosed with acute pancreatitis were retrospectively evaluated. Inclusion criteria were compatible history and clinical signs, elevated serum amylase, lipase, or canine specific lipase activity, and morphologic evidence of pancreatitis by ultrasonography. FNA cytology of the pancreas and/or pancreatic biopsy was also available in a number of cases. The sonograms were performed by multiple sonographers but reviewed and evaluated by one specialist with extensive experience in clinical sonography (Lindquist).

Based on the ultrasound examination, the dogs were divided into two groups: Group 1 consisted of 24 dogs diagnosed with pathology within the left limb of the pancreas and group 2 consisted of 30 dogs that were diagnosed with pathology within the right limb of the pancreas. The presence of abdominal pain, anorexia, vomiting, and diarrhea was correlated between the two groups.

All data were tabulated in a spreadsheet program (Excel<sup>®</sup>) and statistical analysis was performed with the aid of a statistical software package (NCSS<sup>®</sup>, 329 North 1000 East, Kaysville, Utah, USA). Descriptive statistics were used to describe the data. Differences between the groups were tested using one-way analysis of variance with Bonferroni and Tukey-Kramer comparisons. The data was normally distributed and the level of significance was set at p < 0.05.

### RESULTS

There was no difference between age, breed and sex of dogs between the two groups. The mean age of group 1 was 8.7 years and of group 2, 8.5 years. Various breeds were represented in both groups with small breeds being over-represented in both groups. Sex distribution was similar in both groups—11 males in group 1 and 17 in group 2; and 13 females in both group 1 and 2. In group 1, pain was noted in 8 (36%) of the dogs, anorexia in 11 (48%) of the dogs, vomiting in 4 (17%) of the dogs, and diarrhea in 5 (20%) of the dogs. In group 2, pain was noted in 11 (37%) of the dogs, anorexia in 9 (30%) of the dogs, vomiting in 22 (73%) of the dogs, and diarrhea in 2 (8%) of the dogs. A statistical difference between the groups was present with vomiting and diarrhea, with vomiting more common in group 2 and diarrhea more common in group 1.

### **SUMMARY AND CONCLUSIONS**

These findings indicate that there is a clinical difference between right and left-sided pancreatitis, with diarrhea having a statistically significant difference in left-sided pancreatitis and vomiting having a statistically significant difference in right-sided pancreatitis. These differences between the two groups can possibly be ascribed to duodenal and upper gastro-intestinal tract involvement when the right side of the pancreas is affected, resulting in vomiting rather than diarrhea.

### REFERENCES

- Hess RS, Saunders HM, Van Winkle TJ, et al. Clinical, clinicopathologic, radiographic, and ultrasonographic abnormalities in dogs with fatal acute pancreatitis: 70 cases (1986-1995). J Am Vet Med Assoc 1998; 213:665–670.
- 2. Steiner JM. Diagnosis of pancreatitis. *Vet Clin North Am Small Anim Pract* 2003; 33:1181–1195.
- 3. Newman S, Steiner J, Woosley K, et al. Localization of pancreatic inflammation and necrosis in dogs. *J Vet Intern Med* 2004; 18:488–493.
- 4.McCord K, Morley PS, Armstrong J, et al. A multi-institutional study evaluating the diagnostic utility of the spec cPL<sup>™</sup> and SNAP® cPL<sup>™</sup> in clinical acute pancreatitis in 84 dogs. *J Vet Intern Med* 2012; 26:888–896.
- 5. Trivedi S, Marks SL, Kass PH, et al. Sensitivity and specificity of canine pancreasspecific lipase (cPL) and other markers for pancreatitis in 70 dogs with and without histopathologic evidence of pancreatitis. *J Vet Intern Med* 2011;25:1241–1247.