



PATIENT **PRESENTING CLINICAL SIGNS**

Rex Lathrop

History: presented 8/2 for 4-5 day history of lethargy and hyporexia to anorexia, presented with high fever, no peripheral Ln enlargement, no v/d. HX of fish and river exposure 7-10 days ago, lethargy and ataxia pancytopenia, 6 day history of lethargy and hyporexia to anorexia. No history of vomiting or diarrhea. intake labs-pancytopenia, 4DX negative, fecal negative for salmon flukes-cbc review confirmed pancytopenia, repeat CBC path review after 24 hours of fluids/abx, showed acute inflammation with left shift, continued thrombocytopenia and a non-regenerative anemia with acanthocytes Fever persistent/waxing and waning, but not fully resolving currently on unasyn, doxycycline, cerenia, entyce and IV fluids

SPECIES

Canine

BREED

Labrador Retriever

SEX

Neutered male

AGE

5 years

WEIGHT

44.9 lbs

INTERPRETED BY

Eric Lindquist, DMV
DABVP, Cert. IVUSS

IMAGING PERFORMED BY

Dr. Harmon

Abnormal PE/Chem/CBC/UA Results: DIAGNOSTICS: CBC: HCT 32.5%, WBC 4.4 K (L), Lymph 0.26K (L), Eosin 0K (L), PLT 34K (L), Manual PLT ct: 24-36K Chem 17: ALP 316 (H) EPOC: HCT = 36%, pH 7.467 (H/alkalosis), pCO2 24.5K (L), BE(ecf) -6.0 (L) UA: WBC 8/HPF, RBC 11/HPF, Suspected cocci bacteria, No crystals. Manual review of Sediview: struvite crystals, concerns for possible cocci 4DX: negative for all 4 CBC Path review: pancytopenia, non regenerative anemia repeat A FAST, no prostate enlargement noted, mild to moderate mesenteric Ln enlargement CBC at 4pm: Hct 29%, normocytic, normochromic, Plt 24k, MPV inc 17.2, Monocytosis 1.1k Radiographs, 3 view thorax and abdomen: CONCLUSIONS: Benign osseous metaplasia. Otherwise unremarkable thorax. Unremarkable abdomen. IMAGYST, fecal: negative, IMAGYST, blood smear 8/2: There is a pancytopenia, characterized by poorly-regenerative anemia, leukopenia, and thrombocytopenia. Should consider ineffective or decreased production by the bone marrow, or increased peripheral destruction. Conditions include infection (parvovirus, Ehrlichia, bacterial septicemia, endotoxemia), drug-related (estrogen, chemotherapy, idiosyncratic drug reaction), immune-mediated/idiopathic, myelofibrosis/sclerosis and myelophthisis (neoplasia, granulomatous disease), and hemophagocytic syndrome/hypersplenism. Correlate with clinical impression. There is no evidence for hemotropic organisms or blasts. Recheck CBC 8/3 Non-regenerative anemia with acanthocytes Acute inflammation - left shift Thrombocytopenia Anemia has worsened slightly and remains non-regenerative. I suspect anemia of chronic disease/inflammation. There are acanthocytes present today, which may be seen in association with hepatic and splenic neoplasia or significant liver disease. Abdominal imaging may be warranted if not already done. There is a notable left shift today, indicative of acute inflammation. Thrombocytopenia is also persistent. Given the prior history from test ID 2421777, consider ruling out salmon poisoning disease (access to raw fish), which can cause significant inflammation and marked thrombocytopenia. Dogs with SPD will often have GI symptoms, but not always. Peripheral lymph node enlargement and fever are also common. Some patients may not develop symptoms for up to 10 days after ingestion of raw fish.

ULTRASONOGRAPHIC EXAMINATION OF THE ABDOMEN

Urinary System

HOSPITAL NAME

Wilvet Salem

The **urinary bladder**, trigone, and pelvic urethra presented normal thicknesses and normal tone. The ureters were not visible which is normal. No uroliths or sediment were visualized and anechoic urine was present. No evidence of inflammatory or neoplastic changes was noted. Ureteral papillae were normal.

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The **kidneys** revealed normal size and structure, corticomedullary definition and ratio for this age. The cortices presented largely uniform texture with normal echogenic relationship to liver and spleen. Medullary structure differed distinctly from the cortex and no evidence of pelvic dilatation was present. The capsules were acceptably uniform without significant irregularities. The left kidney measured 7.0 cm.

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Adrenal Glands

The caudal aspect of the right adrenal gland was visualized and measured 0.6 cm.

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Spleen

The **spleen** was uniformly enlarged with relatively uniform parenchyma without evidence of masses. The capsule was mildly swollen. This is most consistent with hypersplenism and reactive hyperplasia deriving from splenic white or red pulp. However, early infiltrative disease, such as lymphoma or mast cell neoplasia can, at times, present in this manner. True hypersplenism from an internal medicine standpoint causes sequestering of thrombocytes resulting in thrombocytopenia and anemia. Clinical manifestation of this phenomenon should be considered. US-guided FNA would be best in order to ensure only reactive hyperplasia is present. If clinical signs fit with potential neoplasia or mast cell disease, then Benadryl injection (1 mg/pound IM) 15 minutes prior to FNA would be recommended.

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Liver

The **liver** images submitted revealed subjectively normal liver size, contour, and structure. Parenchymal echogenicity was naturally coarse and hypoechoic to the spleen. Vascular and biliary tracts were of normal volume with no evidence of congestion. The gallbladder presented acceptably thin walls with primarily anechoic content. The cystic and common bile ducts were normal. No pathological hepatic lymphadenopathy was evident. No overt structural evidence of inflammatory, infiltrative or regenerative pathology was evident.

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Gastrointestinal

There was some residual chyme and gas was noted in the **stomach**, yet not pathological. This is consistent with end post prandial presentation. Transit of chyme into the small intestine was normal. Curvilinear patterns were maintained throughout the GI tract. No evidence of pathology. Small and large intestine demonstrated normal luminal chyme and stool consistency respectively. No obstructive or overt infiltrative disease was noted. No associated abnormal lymphatic activity was noted.

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Pancreas

The base and limbs of the **pancreas** were observed to be largely isoechoic to surrounding omental fat. Pancreatic duct and capsular contour were acceptably normal and parenchyma respected normal curvilinear patterns. No overt evidence of active inflammatory or neoplastic disease was noted.

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Free Abdomen

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Slight amount of free fluid was noted in the caudal abdomen, the cause is unclear.

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ULTRASONOGRAPHIC FINDINGS

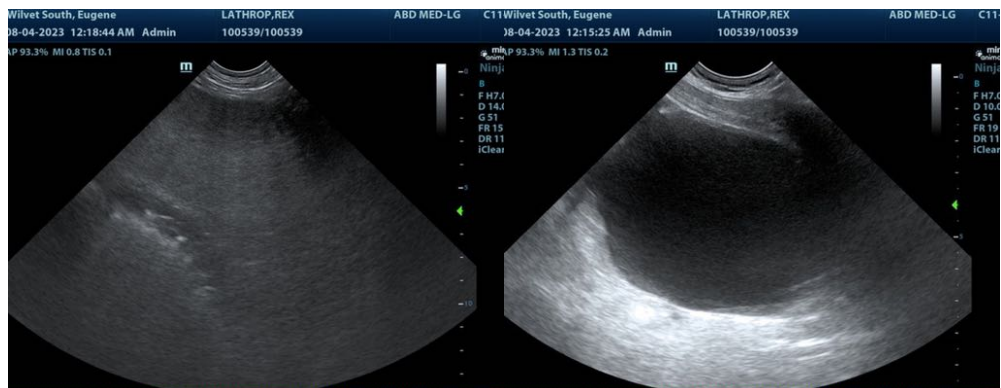
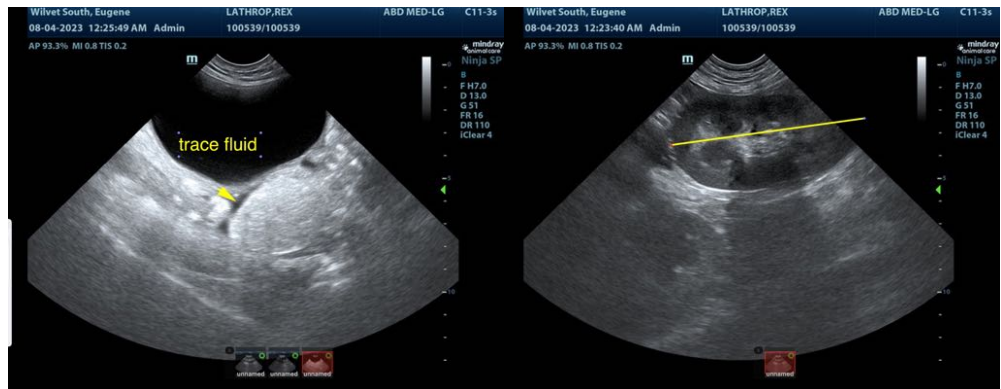
Mild splenic enlargement.

Free fluid.

Otherwise, unremarkable abdomen.

INTERPRETATION OF THE FINDINGS & FURTHER RECOMMENDATIONS

25-gauge FNA of the spleen is indicated along with cytology and possible culture to assess for splenitis. Urine culture is indicated given the urinalysis results.





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The information and recommendations provided are based on the images presented by the referring veterinarian/sonographer. No evaluation can be communicated regarding pathology that was not visible in the image/video clips provided.

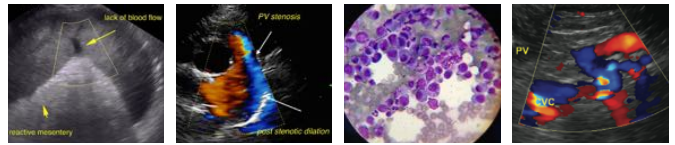
Thank you for this referral. If the clinical or image interpretation does not parallel your findings or if I can be of any further assistance please contact me.

Eric Lindquist, DMV, DABVP, Cert. IVUSS, CEO of SonoPath.com
info@SonoPath.com

Fever of Unknown Origin

<http://www.sonopath.com/FUO>

Description: The definition of a fever of unknown origin (FUO) has not been clearly defined for animals. Currently, it is either understood to be a fever that does not resolve within the period one would expect for a “self-limiting infection” being treated with appropriate antimicrobial therapy, or that for which an underlying diagnosis has not been determined despite considerable diagnostic effort. The common causes of FUO were summarized concisely in a presentation at the American College of Veterinary Internal Medicine 2004 Forum. The presenters synthesized information from three veterinary papers on the subject, which suggested the following:



PATIENT	Final Diagnosis	Bennett (dogs & cats)	Dunn and Dunn (dogs only)	Lunn (dogs & one cat)	Total
Rex Lathrop					
SPECIES	Infection	21	16	10	47
Canine	Immune	18	22	6	46
BREED	Bone marrow disease	4	22	2	28
Labrador Retriever	Neoplasia (outside marrow)	0	10	2	12
SEX	Miscellaneous	2	12	2	16
Neutered male	No diagnosis	0	19	2	21
AGE	TOTALS	45	101	24	170
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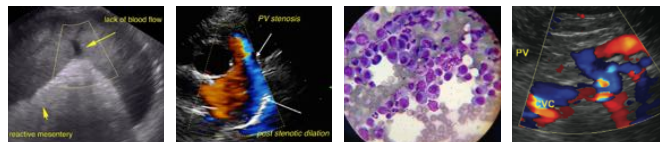
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The types of infection diagnosed in this case series were varied, ranging from discospondylitis (8 cases), blastomycosis (6), and bacterial endocarditis (4), to leishmaniasis (1), prostatitis (1), and *Ehrlichia canis* infection (1); a multitude of other infectious causes also fell within the spectrum. Of the cases in which immune-mediated disease was found, 44% had immune-mediated polyarthritis. Bone marrow diseases included myeloproliferative disease, myelodysplasia (8), lymphocytic leukemia (8), myeloma (3), chronic granulocytic leukemia (3), lymphoblastic leukemia, and malignant histiocytosis. The types of neoplasia located outside the bone marrow included lymphoma (6), metastatic disease (2), and neoplasms of the lung, spleen, and stomach. Finally, miscellaneous diseases included hypertrophic osteodystrophy (6), meningitis (3), portosystemic shunt (3), lymphadenitis (2), panosteitis, and intervertebral disc disease. Overall, the most common causes across all cases were polyarthritis (44), lymphoid neoplasia (15), discospondylitis (8), myelodysplasia (8), hypertrophic osteodystrophy (6), and blastomycosis (6).

Clinical Signs: Animals usually present with either persistent or waxing and waning fevers ranging from 103°F to 106°F. Other clinical signs depend on the underlying cause of the fever. Careful and thorough physical examination is required to assess potential causes.

Diagnostics: F.U.O etiologies are partly related to geography, and thus locale or travel history should factor into a practitioner's diagnostic approach. A patient's lifestyle may also provide clues regarding exposure to certain etiologic agents. Therefore, conducting a thorough history can unveil important pieces of the diagnostic puzzle. Physical examination is especially important and should include an inspection of all accessible lymph nodes, palpation and movement of the joints, a fundic examination, a neurological evaluation, spinal and limb palpation and range of motion tests, and a rectal examination.



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A minimum database should include a CBC reviewed by a clinical pathologist, as well as a biochemical profile and urinalysis. Retroviral testing should also be considered in cats. In areas where tick-borne disease is prevalent, in-house testing should be performed early. Advanced laboratory work can include: urine culture, blood culture, and infectious disease panels (PCR and/or serology). In dogs, one may screen for the following infectious agents: *Ehrlichia* spp., *Borrelia burgdorferi*, Rock Mountain Spotted Fever, *Bartonella* spp. (culture and PCR), and *Leptospira* spp. in cases of hepatic or renal involvement. In cats, one should evaluate for FeLV, FIV, feline infectious peritonitis (FIP) virus, toxoplasmosis, *Hemoplasma* spp. (*Mycoplasma*), and *Bartonella* spp. (culture and PCR). Testing for *Ehrlichia* spp., *Rickettsia* spp., and *Anaplasma phagocytophilum* can also be considered. A fungal assay is indicated if the patient lives in or has had exposure to a region with a higher incidence of fungal disease. Other infectious disease tests may be performed depending on the geographical location of the pet. Screening for *Brucella* should be done in breeding dogs. Immune-mediated disease screening can include a Coomb's test, a slide agglutination test (if the patient is anemic), and an antinuclear antibody (ANA) test. Immune disease is often a diagnosis of exclusion.

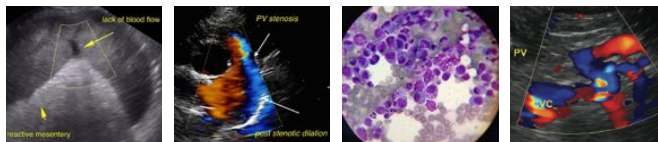
Imaging should include thoracic radiographs, abdominal ultrasound, and/or abdominal radiographs. Ultrasound can be very useful for assessing evidence of cholangiohepatitis, pyelonephritis, chronic urinary tract infection, abscess formation, peritonitis, and neoplasia; it also permits an examination of the intra-abdominal lymph nodes. An echocardiogram can offer assessment for vegetative endocarditis, whereas spinal radiographs offer assessment for discospondylitis. In cases where all other testing has proven negative and the patient has not responded to broad-spectrum antibiotics and supportive care, arthrocentesis should be considered to evaluate for septic joint disease, immune-mediated polyarthritis, and infectious disease. Finally, one can consider assessing the cerebrospinal fluid for meningoencephalitis, GME, and meningitis/arteritis. A bone marrow exam should be performed if blood dyscrasias are noted on the CBC.

Treatment: Treatment of the fever depends entirely on the underlying cause. Ideally, a thorough diagnostic plan will yield a diagnosis that will guide the appropriate therapeutic course. However, if an exhaustive approach has not produced a definitive diagnosis and there is no response to broad-spectrum antibiotics, trial therapy with immunosuppressive agents such as prednisolone can be considered to treat presumed immune-mediated diseases. Given the potential for negative sequelae should an underlying infection be present, one must be certain that the investigation is thorough and monitor the patient's response carefully.

Conclusion: If a documented fever has not responded to antibiotics, antipyretics, or general nursing care, it is important to obtain a diagnosis to guide more specific treatment. A systematic physical examination and thorough history-taking will help inform further diagnostics in addition to what is revealed by the minimum database.

References:

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PATIENT

Dunn KJ, Dunn JK. Diagnostic investigations in 101 dogs with pyrexia of unknown origin. *J Sm Anim Pract* 1998;39(12):574-80.

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SPECIES

Flood J. The diagnostic approach to fever of unknown origin in cats. *Compend Contin Educ Vet* 2009;31(1):26-31.

Canine

Flood J. The diagnostic approach to fever of unknown origin in dogs. *Compend Contin Educ Vet* 2009;31(1):14-21.

BREED

Labrador Retriever

Lappin MR. The role of blood borne pathogens in feline fever of unknown origin. Proceedings from the American College of Veterinary Internal Medicine, Denver, CO, June 15-18, 2011.

SEX

Neutered male

Lunn KF. Fever of unknown origin: a systematic approach to diagnosis. *Compend Contin Educ Vet* 2001;23(11):976-92.

Lunn KF. Fever of unknown origin: appropriate choice of diagnostic tests. Proceedings from the American College of Veterinary Internal Medicine, Minneapolis, MN, June 9-12, 2004.

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