



**PATIENT**

Lucy Simmons

**SPECIES**

Feline

**BREED**

DLH

**SEX**

Spayed Female

**AGE**

11 Years

**WEIGHT**

3.7 kg

**INTERPRETED BY**

Eric Lindquist, DMV  
DABVP, Cert. IVUSS

**IMAGING PERFORMED BY**

Dr. Callihan

**HOSPITAL NAME**

Animal Emergency  
Care

**REFERRING VET**

Dr. Callihan

**INVOICE**

14790

**DATE**

4/16/22

**PRESENTING CLINICAL SIGNS**

History: Presented on ER last night for anorexia, lethargy; not moving around much; indoor only cat with no significant health history; no known gastric indiscretion or potential for access to toxins.

Abnormal PE/Chem/CBC/UA Results: Febrile temp ~ 105; CBC normal, chems w slight elev globulin (6.5) with elev TP 9.3; slight hypokalemia, else normal Fever dropped initially and now back to 105

**ULTRASONOGRAPHIC EXAMINATION OF THE ABDOMEN**

**Urinary System**

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 were noted. Ureteral papillae were normal. The pelvic urethra was imaged 2.0 cm beyond the cystourethral junction.

The **kidneys** revealed largely normal size and structure, corticomedullary definition and ratio (cortex 1/3 of medulla) were essentially maintained with some moderate age-related loss of curvilinear patterns regarding the capsule and C/M junction. The cortices presented largely uniform texture with some increased echogenicity expected for his age patient. Medullary structure differed distinctly from that of the cortex and no evidence of pelvic dilation was present. The left kidney measured 4.11 cm. The right kidney measured 4.15 cm.

**Adrenal Glands**

The regions of the **adrenal glands** were visualized. No evidence of pathology.

**Spleen**

The **spleen** was mildly enlarged with uniform, but subtly micronodular parenchyma, and undulating capsular contour. This is consistent with minor reactive spleen owing to immune stimulus or early infiltrative disease such as mast cell disease or lymphoma. 25-gauge FNA would be ideal if weight loss is an issue to differentiate early round cell neoplasia versus splenitis or reactive spleen all of which can present in this manner. The spleen measured 0.96 cm.

**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.

**Gastrointestinal**

Examination of the **gastrointestinal tract** revealed a stomach and intestine free of stasis, of normal wall thickness, acceptable curvilinear mural detail, and peristaltic activity. 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. Intestinal wall thickness measured 0.28 cm.



**PATIENT**

**Pancreas**

Lucy Simmons

The **pancreas** was mildly enlarged, hypoechoic and irregular. The pancreas measured 1.0 cm.

**SPECIES**

Feline

**ULTRASONOGRAPHIC FINDINGS**

- Moderate age-related renal changes
- Minor irregular pancreas. No evidence of neoplasia.
- Otherwise, unremarkable abdomen

**BREED**

DLH

**INTERPRETATION OF THE FINDINGS & FURTHER RECOMMENDATIONS**

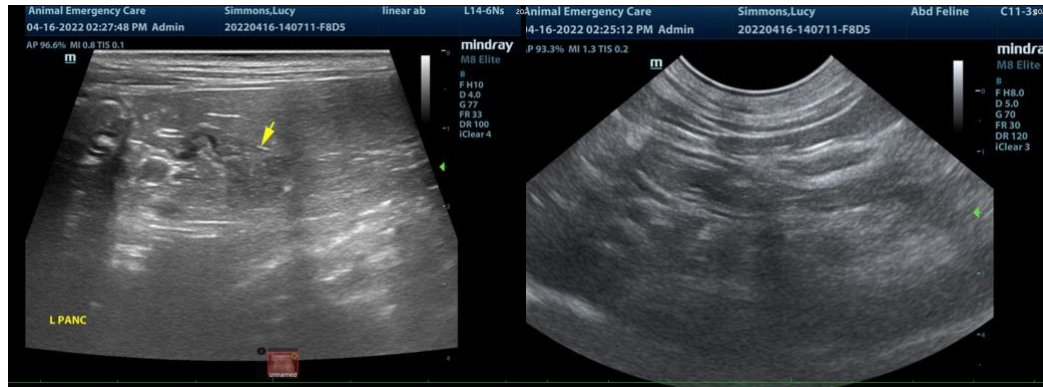
**SEX**

Spayed Female

No evidence of visceral disease other than minor irregular pancreas. Possible minor pancreatitis. Subxiphoid palpation is recommended to assess for pain or discomfort associated with the pancreas.

**AGE**

11 Years

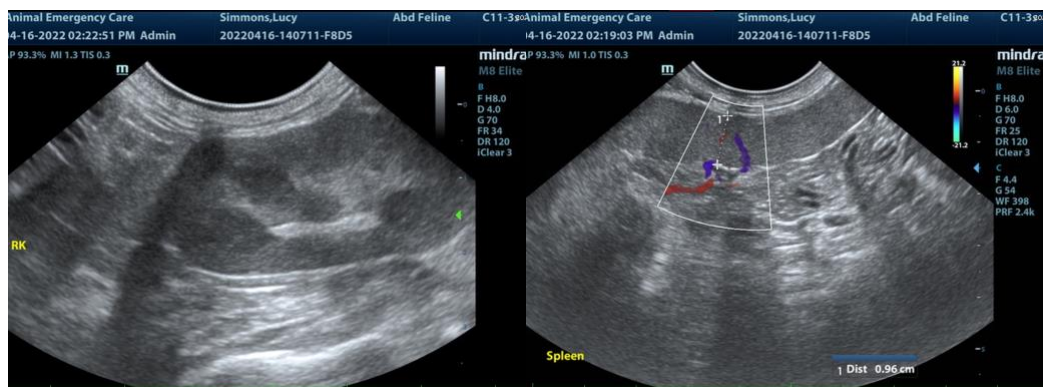


**WEIGHT**

3.7 kg

**INTERPRETED BY**

Eric Lindquist, DMV  
DABVP, Cert. IVUSS

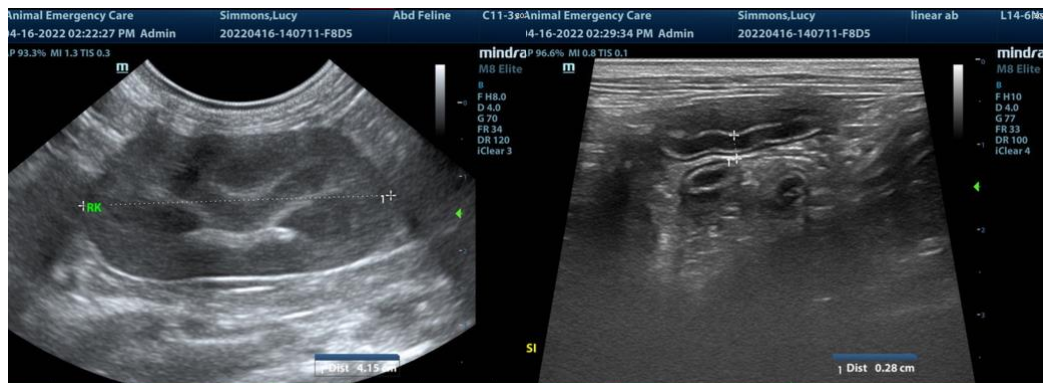


**IMAGING PERFORMED BY**

Dr. Callihan

**HOSPITAL NAME**

Animal Emergency  
Care



**REFERRING VET**

Dr. Callihan

**INVOICE**

14790

**DATE**

4/16/22



## PATIENT

Lucy Simmons

## SPECIES

Feline

## BREED

DLH

## SEX

Spayed Female

## AGE

11 Years

## WEIGHT

3.7 kg

## INTERPRETED BY

Eric Lindquist, DMV  
DABVP, Cert. IVUSS

## IMAGING PERFORMED BY

Dr. Callihan

## HOSPITAL NAME

Animal Emergency  
Care

## REFERRING VET

Dr. Callihan

## INVOICE

14790

## DATE

4/16/22



The information and recommendations provided are based on the images presented by the referring veterinarian. 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:

Final Diagnosis	Bennett (dogs & cats)	Dunn and Dunn (dogs only)	Lunn (dogs & one cat)	Total
Infection	21	16	10	47
Immune	18	22	6	46



**PATIENT**

Lucy Simmons

**SPECIES**

Feline

**BREED**

DLH

**SEX**

Spayed Female

**AGE**

11 Years

**WEIGHT**

3.7 kg

**INTERPRETED BY**

Eric Lindquist, DMV  
DABVP, Cert. IVUSS

**IMAGING PERFORMED BY**

Dr. Callihan

**HOSPITAL NAME**

Animal Emergency  
Care

**REFERRING VET**

Dr. Callihan

**INVOICE**

14790

**DATE**

4/16/22

	Final Diagnosis	Bennett (dogs & cats)	Dunn and Dunn (dogs only)	Lunn (dogs & one cat)	Total
	Bone marrow disease	4	22	2	28
	Neoplasia (outside marrow)	0	10	2	12
	Miscellaneous	2	12	2	16
	No diagnosis	0	19	2	21
	<b>TOTALS</b>	45	101	24	170

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:** FUO 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.

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



**PATIENT**

Lucy Simmons

**SPECIES**

Feline

**BREED**

DLH

**SEX**

Spayed Female

**AGE**

11 Years

**WEIGHT**

3.7 kg

**INTERPRETED BY**

Eric Lindquist, DMV  
DABVP, Cert. IVUSS

**IMAGING PERFORMED BY**

Dr. Callihan

**HOSPITAL NAME**

Animal Emergency  
Care

**REFERRING VET**

Dr. Callihan

**INVOICE**

14790

**DATE**

4/16/22

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:**

Bennet D. Diagnosis of pyrexia of unknown origin. *In Practice* 1995;17(10):470-81.

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

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



**PATIENT**

Lucy Simmons

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

**SPECIES**

Feline

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.

**BREED**

DLH

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

**SEX**

Spayed Female

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.

**AGE**

11 Years

**WEIGHT**

3.7 kg

**INTERPRETED BY**

Eric Lindquist, DMV  
DABVP, Cert. IVUSS

**IMAGING PERFORMED BY**

Dr. Callihan

**HOSPITAL NAME**

Animal Emergency  
Care

**REFERRING VET**

Dr. Callihan

**INVOICE**

14790

**DATE**

4/16/22