SANCTUARI

A Possible Non-Surgical Treatment for Pyometra in Virginia Opossums and Other Species

In Loving Memory of Cubbie

Cubbie, a Virginia opossum of two years of age as of February 2019, began urinating on her exercise wheel during use, often cited by rehabbers as signaling a UTI[1] or more rarely pyometra.[2]

Cubbie was very physically active and of a good and energetic disposition, but her activity level in February 2019 seemed to her caretaker to be more variable and to trend lower overall.

Cubbie's adult weight was relatively steady at ~4-½ kg (9-¾ lbs.) and noted as 4.47 kg (9.74 lbs.) on July 07, 2020. This is given to help readers scale following dosages. Note that proper MEC/SMEC adjustments should be made if adapting following dosages to other species.

On December 2nd, 2019, Cubbie began a course of cefpodoxime (100 mg #5, 1/2 tab every 24 hours for 5 days). Symptoms seemed to subside but then return.

On February 3rd, 2020, Cubbie began a course of enrofloxacin (68mg #5, 1/3 tab every 24 hours, duration estimated at 10 days due to a data loss). This treatment seemed less successful than prior, and veterinary opinion held that pyometra was likelier than UTI.

---

[1] Urinary tract infection

[2] Pyometra is a secondary infection resulting from hormonal changes in female reproductive tracts, where, following estrus, progesterone levels remain elevated, causing uterine lining to thicken in preparation for pregnancy. Pyometra can be "open" or "closed." In the former case, an open cervix allows purulent and/or bloody discharge to be seen from the vulva. In the latter, no discharge is seen, and the abdomen may swell or distend as the uterus enlarges with fluid.

A full OVH[3] is often recommended in cases like this, but such an approach was decided against in Cubbie's case. She was approaching "standard lifespan for a wild Virginia opossum," often cited as 2 – 2½ years for females and 1½ years for males. Also, our research found unacceptable survival rates for full OVH in Virginia opossums, with less than two thirds surviving surgery, and with incorrectly performed surgeries being one of many contributors. Further, "successful" surgeries entailed survival for only 3 more months. We chose to keep Cubbie intact.

On March 3rd, 2020, treatment with SMZ-TMP (trimethoprim-sulfamethoxazole) began (200-40mg/5ml suspension, 1.5ml every 12 hours for 10 days). This was deemed unsuccessful also. Veterinary opinion was that closed pyometra remained unaffected.

On April 6th, 2020, in a gap in veterinary responsiveness, one dose of orbifloxacin was given, but upon the lead veterinarian restoring communications, chloramphenicol was begun on April 7th, 2020 (200mg/ml suspension, 1 ml every 12 hours for 10 days). This seemed successful, with thick, greenish-white discharge soon after evident, consistently for a span of many weeks, leading to the hypothesis that formerly closed pyometra had opened and was draining. Example photos below show this on July 19th, 2020, and August 3rd, 2020, respectively.

[3] Ovariohysterectomy

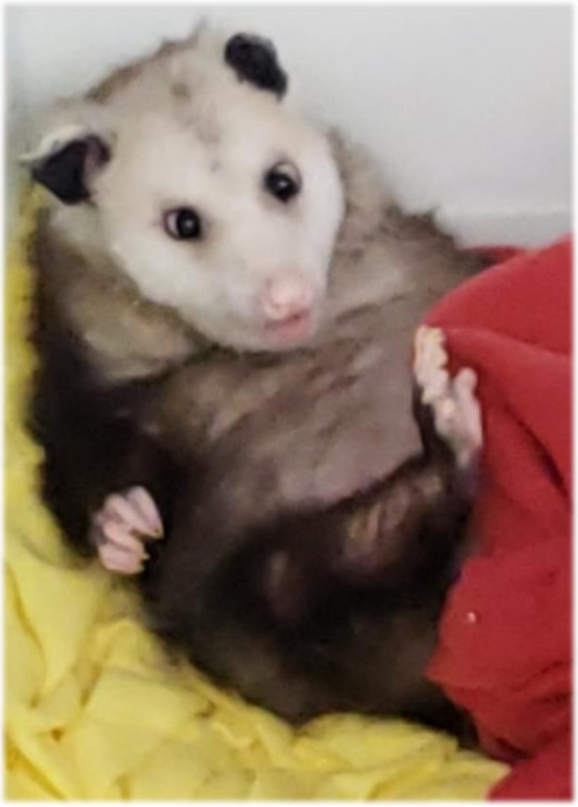
On February 16th, 2021, Cubbie passed away at age four next to her caregiver. Cubbie was not "euthanized," as we do not ever "euthanize."

Cubbie's post-mortem analysis which follows shows she did not pass due to pyometra.

We hypothesize the chloramphenicol may have been key in helping Cubbie prevail, if not the broader sequence of medications overall. Insights from the following post-mortem cultures may also help tailor more effective courses of action for future pyometra sufferers.

We seek constructive opinions on the information herein, which could also be extended to various dog breeds and other species as well.

We ask qualified persons trying to aid animals with pyometra to share relevant input or related experiences with us, in honor of our beloved Cubbie.



Cubbie

Post-Mortem Culture Test Results

Culture, Aerobic #1 & #2, source swab: pyometra. Final report 02/21/2021.
Preliminary #1, 02/19/2021, organism #1, pseudomonas aeruginosa, light growth.
Preliminary #2, 02/20/2021, organism #2, coagulase negative staphylococcus spp., light growth.

Sensitivities (gram negative) #1
Amikacin: Susceptible
Ampicillin: Resistant
Cephalothin: Resistant
Clavamox: Resistant
Chloramphenicol: Resistant
Doxycycline: Resistant
Enrofloxacin: Susceptible
Gentamicin: Susceptible
Marbofloxacin: Susceptible
Neomycin: Susceptible
Tetracycline: Resistant
Trimethoprim/Sulfa: Resistant

Sensitivities (gram positive) #2
Ampicillin: Susceptible
Cephalothin: Susceptible
Clavamox: Susceptible
Clindamycin: Susceptible
Chloramphenicol: Susceptible
Enrofloxacin: Susceptible
Erythromycin: Susceptible
Gentamicin: Susceptible
Marbofloxacin: Susceptible
Methacillin: Susceptible
Neomycin: Susceptible
Tetracycline: Susceptible
Trimethoprim/Sulfa: Susceptible

Post-Mortem Full Histopathology

Liver/liver-associated cyst/mesenteric nodule.[4]

Necropsy: Pyometra chronic for ~1 year. Last 2 months rear limb paralysis. Most organs grossly appear WNL (within normal limits). Cyst-like structure in liver sent/mesenteric firm nodule.

Received a 3.0 cm x 1.5 cm, a 2.0 cm x 2.5 cm, and a <1.0 cm tissue, all processed (source: necropsy).

Microscopic Descriptions

Mesenteric nodule: Examined sections consist of largely necrotic mesenteric fat circumscribed by abundant macrophages[5] and fewer granulocytes[6]. Multifocally adipose tissue[7] is mineralized.

[4] The mesentery is a fold of membrane which attaches intestines to the abdominal wall to hold them in place. Mesenteric nodules can be defined as tumors lacking evidence of lymph node tissues or architectures.
[5] specialized cells which detect and destroy bacteria and other harmful organisms
[6] white blood cells with enzymes released during infections, allergic reactions, and asthma
[7] a specialized connective tissue of fat-rich cells to store energy

Liver: Hepatic sinusoids[8] are multifocally and frequently expanded by large numbers of neoplastic round cells.[9] Neoplastic cells have large vesicular nuclei[10] and small amounts of amphophilic cytoplasm.[11] Anisocytosis[12] and anisokaryosis[13] are high, and there are occasional multinucleated cells. Erythrophagia[14] is frequently observed. There are approximately 40 mitotic figures in 10 high power fields.

Liver-associated cyst: Examined sections consist of dense fibrous connective tissue invested randomly with dilated lymphatics and veins and bile ducts. The cystic space is occasionally lined by a low cuboidal (biliary) epithelium. Within this dense connective tissue there are low numbers of scattered hemosiderophages,[15] hemorrhages, lymphocytes,[16] plasma cells, and entrapped hepatocytes.[17]

Microscopic Findings

Liver: Malignant round cell neoplasia. See comments below.

Liver associated cyst: Biliary cyst with severe regionally extensive fibrosis.[18]

Mesenteric nodule: Necrotizing granulomatous steatitis[19] with mineralization.

Comments from Pathology Team

'Four doctors were consulted on this interesting case, which elicited much debate. We considered marked myeloid leukemoid reaction in the liver from the pyometra described as opposed to a round cell tumor. However, overall, a round cell tumor is favored here. More

[8] a network of microscopic vessels where worn-out red cells, bacteria, and other debris are removed from blood and in which nutrients are exchanged
[9] evidencing abdominal/pelvic tumors; round cell tumors are a type of soft tissue sarcoma, a type of cancer of connective tissue
[10] implying aggressive growth
[11] implying cancer cells, uncontrolled growth
[12] unequal red blood cell size, causing symptoms of anemia and other blood disorders such as weakness, fatigue, pale skin, and shortness of breath, many from decrease in oxygen delivery; seen with cardiovascular disease and some cancers
[13] variation in sizes of nuclei in cells
[14] destruction of red blood cells
[15] macrophages that have ingested and digested red blood cells
[16] white blood cells occurring principally in the lymphatic system
[17] liver cells
[18] Researchers think these cysts form when intersection between the bile duct and pancreatic duct is abnormal, forcing pancreatic juice to flow backward into the bile duct.
[19] dying, inflamed fatty tissue, often seen in conjunction with pancreatic or liver cancers

specifically, myeloid leukemia is favored here, which has been described in opossums before.[20] A CBC[21] would have helped support this diagnosis if one had been available.

'Since erythrophagia was present, HS-TCL[22] was also considered as a possible differential for this round cell tumor, but this has not been described in opossums and is considered less likely.

'The mesenteric nodule may represent a necrotic lipoma[23] or may be associated with peritonitis[24] from the pyometra.

Cubbie with some of her favorite things: her exercise wheel, a snack of pak choi, and soft blankets

[20] Pope JP, Donnell RL. Spontaneous neoplasms in captive Virginia opossums (Didelphis virginiana): a retrospective case series (1989-2014) and review of the literature. Journal of Veterinary Diagnostic Investigation. 2017;29(3):331-337. doi:10.1177/1040638717704017.
[21] complete blood count
[22] hepatosplenic T-cell lymphoma
[23] a fatty, non-cancerous, usually harmless, slow-growing tumor
[24] inflammation usually from bacterial or fungal infection of the peritoneum, a membrane lining the abdominal wall, covering abdominal organs