ILLINOIS

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# Final Report

VCA - AURORA ANML HOSP #393
**Vet:** SHEILA M MCCULLOUGH
2600 W GALENA BLVD
AURORA, IL 60506

**Case#:** 18-30920
**Accessioned:** 01/24/18
**Report Generated:** 02/01/18 @ 8:46 AM by AMD
**Results Last Modified:** 01/31/18 @ 5:36 PM

| Case ID | Owner | Coordinator | |
|---|---|---|---|
| Cameo | Small Paws Rescue | VIESON | |
| **Breed** | **Species** | **Sex / Fixed** | **Age** |
| Mixed Breed Dog | Canine (dog) | Female - Spayed / | 2.5 Years |

## Pathology

**Necropsy, Gross** Report - Verified: 01/25/18 10:00 AM by TP2
1830920 Vieson/Teixeira-Neto
REF VET: Dr. McCullough

GROSS DESCRIPTION:

The necropsy began at 1:00 PM and ended at 2:00 PM on 1/24/18.

An adult (approximately 2.5-year-old, per history), 4.3 kg, spayed female, white mixed breed dog is submitted in good post-mortem condition. The dog is in good nutritional condition (body condition score 4/9) characterized by adequate visceral and subcutaneous fat stores and adequate musculature. The mucous membranes are pale pink to white. The left front carpus is clipped on the dorsal aspect. There is a moderate amount of black, tarry feces on the perianal and ventral aspect of the base of the tail. There are large numbers of pinpoint, up to 2 mm in diameter, black foci scattered throughout the skin of the ventral abdomen, concentrated at the inguinal region and around the vulva. Bilaterally, within the vertical and ventral parts of the external ear canal there are small to moderate amounts of pale to dark brown, waxy, friable to crusty material (ceruminous debris). There is a small amount of tan to yellow, hard, material covering the crown of the premolar teeth (tartar).

Upon sectioning of the ear canal, there is accumulation of similar ceruminous debris within the base of the horizontal portion compressing the tympanic membrane, which is intact.

Upon cross and longitudinal sectioning of the head, there is multifocal, uneven dark reddening of the nasal mucosa, most concentrated at the ventral left turbinates. There is a small amount of dark brown, mucoid to viscous material within the left caudal nasal cavity, near the cribriform plate.

There is negative pressure within the thoracic cavity, and about 30 mL of watery, slightly turbid, red-tinged fluid within the pleural cavity. There is a smooth, light red, friable membrane (fibrinous exudation) loosely adherent to the visceral pleura of all lung lobes and covering the pericardium, bilaterally. Diffusely, lungs are purple to dark red, non-collapsed, wet and heavy. A moderate to large amount of thin red clear translucent fluid oozes from the parenchymal cut surface, and into the main bronchi upon manipulation. Samples of the cranioventral lung fields sink, and the caudodorsal sections partially sink in formalin. The larynx, tracheal and bronchial mucosae are pink and smooth.

The heart weighs 37.6 g (0.87% of body weight). The right ventricle is 0.4 cm thick, the left ventricle is 0.8 cm thick, and the interventricular septum is 0.8 cm thick. No significant abnormalities are noted in the great vessels, valves, or cardiac chambers.

The liver is evenly light brown, with smooth edges, and weighs 144.55 g (3.4% of body weight).



The stomach is pale pink and mostly gas distended with a scant amount of tan mucoid and frothy material. The small intestines contain a small amount of pale red mucoid digesta. The colon contains a moderate amount of soft black feces. The mucosa and serosal surfaces are unremarkable. A single, approximately 1 cm long, thin metal wire is embedded within the greater omentum. There is no vascular or inflammatory reaction associated with it.

The bone marrow is deep red, soft and sinks in formalin.

The brain is grossly unremarkable. The spinal cord is not examined.

MORPHOLOGIC DIAGNOSES:

There is negative pressure within the thoracic cavity, and about 30 mL of watery, slightly turbid, red-tinged fluid within the pleural cavity. There is a smooth, light red, friable membrane (fibrinous exudation) loosely adherent to the visceral pleura of all lung lobes and covering the pericardium, bilaterally. Diffusely, lungs are purple to dark red, non-collapsed, wet and heavy. A moderate to large amount of thin red clear translucent fluid oozes from the parenchymal cut surface, and into the main bronchi upon manipulation. Samples of the cranioventral lung fields sink, and the caudodorsal sections partially sink in formalin. The larynx, tracheal and bronchial mucosae are pink and smooth.

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MORPHOLOGIC DIAGNOSES:
1. LUNGS: SEVERE, DIFFUSE, ACUTE PNEUMOPATHY (FIBRINOUS ALVEOLITIS VS. INTERSTITIAL PNEUMONIA VS. PULMONARY CONGESTION AND EDEMA)
2. PLEURAL CAVITY: MODERATE SEROSANGUINEOUS EFFUSION
3. NASAL CAVITY: MODERATE, MULTIFOCAL, RHINITIS
4. INTESTINAL TRACT: MILD TO MODERATE MELENA
5. GREATER OMENTUM: FOCAL LINEAR METALLIC FOREIGN BODY
6. EXTERNAL EAR CANAL: MODERATE, BILATERAL OTITIS EXTERNA
7. ORAL CAVITY (TEETH): MILD PERIODONTAL DISEASE

COMMENTS:

Significant findings are primarily located in the lungs with features that may suggest an infectious etiology, severe acute pulmonary edema and congestion, or acute respiratory distress syndrome (ARDS). Histopathology is pending to further characterize the gross findings and samples of the lung are submitted for aerobic bacterial culture, influenza PCR, and FA testing for canine distemper virus and canine parainfluenza virus. Results will be filed to the report as they become available.

The small fragment of metallic material on the radiographs was located within the greater omental fat with no tissue reaction – so this is likely an incidental finding.

Miranda D. Vieson, DVM, PhD, DACVP

**Necropsy, Histopath** Report - Verified: 01/31/18 3:03 PM by AMD
1830920 Vieson/Teixeira-Neto
REF VET: Dr. McCullough

HISTOPATHOLOGY REPORT:

SLIDES 1 and 2, Nasal turbinates: Eight sections are examined. Multifocally, the nasal mucosa is eroded to ulcerated. Multiple sloughed epithelial cells as well as those preserved along the mucosa are either swollen with pale cytoplasm and vesicular nucleus (degeneration), or shrunken with hypereosinophilic cytoplasm and pyknotic, karyorrhectic, or karyolytic nucleus (necrosis). Degenerate and necrotic epithelia often contain an intranuclear, 5-8 µm in diameter, eosinophilic, glassy globular inclusion body surrounded by a clear halo and a peripheral thin rim of chromatin. Free within the nasal cavity and closely associated with the eroded or ulcerated mucosa are loose membranes of necrotic epithelia mixed with strands of fibrin, amphophilic wispy material (mucus), nuclear debris and few scattered colonies of mixed bacteria. The nasal substantia propria is moderately edematous with ectatic blood vessels often filled with fibrin strands and degenerate leukocytes.

SLIDES 3 and 4, Lung: Three sections are examined. The epithelial cells of most terminal bronchioles and bronchi are frequently sloughed within the lumen and mixed with delicate membranes of fibrin and granular cellular debris. Alveoli, mostly surrounding affected bronchioles, contain a combination of pale eosinophilic wispy to flocculent material (edema) mixed with similar strands of fibrin, rarely forming crescent-shaped thin hyaline membranes, and small numbers of viable, swollen neutrophils and foamy macrophages. The alveolar interstitium is also multifocally expanded by mild edema and contains low numbers of similarly swollen neutrophils within capillaries admixed with fibrin strands and megakaryocytes. There are rare hemosiderin-laden macrophages randomly distributed within alveolar septa.

SLIDE 4, Trachea: One section is examined. The mucosal epithelia are mostly sloughed (post-mortem), and the remaining basal epithelial cells rarely have a swollen nucleus with vesicular chromatin and prominent nucleoli.



SLIDE 4, Submandibular lymph node: One section is examined. Subcapsular sinuses are mildly expanded by clear spaces (edema). There are moderate numbers of hemosiderophages scattered throughout paracortical and medullary sinuses.

SLIDE 5, External ear canal: One section is examined. Multifocally, the stratum corneum is moderately thickened due to

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SLIDE 4, Submandibular lymph node: One section is examined. Subcapsular sinuses are mildly expanded by clear spaces (edema). There are moderate numbers of hemosiderophages scattered throughout paracortical and medullary sinuses.

SLIDE 5, External ear canal: One section is examined. Multifocally, the stratum corneum is moderately thickened due to increased amounts of dense laminated keratin (hyperkeratosis). Admixed in the keratin are large numbers of admixed 4 x 2 µm, ovoid to piriform, pale amphophilic fungal yeasts (morphology consistent with Malassezia sp.) and a few small colonies of large cocci bacteria. The dermis is multifocally infiltrated by small numbers of lymphocytes, plasma cells and hemosiderophages.

SLIDE 6, Heart: Two sections are examined. There are no significant findings.

SLIDE 7, Adrenal glands: Two sections are examined. Bilaterally and randomly scattered throughout the cortical parenchyma are small, well-demarcated areas that are obscured by hypereosinophilic, moth-eaten, vacuolated, and fragmented cortical epithelial cells (necrosis) associated with mild hemorrhage and fibrinous exudate. There are rare cortical epithelial cells with intranuclear eosinophilic inclusion bodies, similar to those described in SLIDE 1 adjacent to the necrotic foci.

SLIDE 7, Thyroid and parathyroid glands: Two sections are examined. There is a decreased amount of colloid within all thyroid follicles. The parathyroid glands are unremarkable.

SLIDE 7, Stomach: One section is examined. There are no significant findings.

SLIDE 8, Pancreas and duodenum: Three sections are examined. There are no significant findings.

SLIDE 9, Jejunum: Two sections are examined. There are no significant findings.

SLIDE 9, Colon: One section is examined. There are no significant findings.

SLIDE 10, Kidneys: Two sections are examined. There are rare mildly dilated cortical tubules lined by plump (hypertrophied) epithelial cells with abundant eosinophilic cytoplasm and a swollen nucleus. The cortical interstitium is multifocally infiltrated by small numbers of lymphocytes and plasma cells. Occasional medullary collecting ducts contain intraluminal amorphous aggregates of hyperbasophilic, anisotropic material (mineral), which impinge on the basement membrane or replace epithelial cells.

SLIDE 10, Urinary bladder: One section is examined. There are no significant findings.

SLIDE 11, Liver: Two sections are examined. Randomly scattered throughout the hepatic parenchyma and disrupting hepatocellular cords are numerous small- to medium-sized, well-demarcated foci of lytic necrosis characterized by aggregates of amorphous to granular eosinophilic debris associated with fibrin exudation and, occasionally, hemorrhage. At the periphery of the necrotic regions are rare hepatocytes with intranuclear eosinophilic inclusion bodies similar to those described in SLIDE 1. Rare portal tracts are infiltrated by small numbers of lymphocytes, plasma cells and histiocytes.

SLIDE 11, Spleen: One section is examined. There are multifocal to coalescing, well-demarcated foci of lytic necrosis associated with abundant fibrin, mostly centered on the white pulp disrupting lymphoid follicles. At the periphery of the necrotic foci, there are rare swollen cells (stromal vs. lymphoid vs. endothelial cells) with vesicular nuclei and eosinophilic inclusion bodies.

SLIDES 12 and 13, Cerebrum (telencephalic cortex with hippocampus), brainstem and cerebellum: Three sections are examined. There are no significant findings.

SLIDE 14, Bone marrow: Two fragments are examined. The bone marrow is moderately hypercellular (approximately 70%) and comprises a slightly decreased myeloid:erythroid ratio (about 1:3). The myeloid lineage is mostly composed of early to intermediate stages (blasts and metamyelocytes), with indistinct bands or segmented granulocytes (left shift). The erythroid lineage consists of mostly late mature stages (rubricytes and metarubricytes). Plasma cells and hemosiderophages (iron stores) are moderately increased in number. There are approximately 5 megakaryocytes per high (400x) power field.



MICROSCOPIC DIAGNOSES:
1. NASAL TURBINATES: MULTIFOCAL TO COALESCING, ACUTE, NECROTIZING RHINITIS WITH INTRAEPITHELIAL INTRANUCLEAR INCLUSION BODIES
2. LUNG: DIFFUSE, ACUTE, EXUDATIVE ALVEOLITIS WITH PULMONARY EDEMA
3. LIVER: MULTIFOCAL TO COALESCING, ACUTE, NECROTIZING HEPATITIS WITH RARE INTRAHEPATOCELLULAR INTRANUCLEAR INCLUSION BODIES
4. SPLEEN: MULTIFOCAL, ACUTE, NECROTIZING SPLENITIS WITH RARE INTRANUCLEAR INCLUSION BODIES
5. ADRENAL GLANDS: BILATERAL, MULTIFOCAL, ACUTE, NECROHEMORRHAGIC ADRENALITIS WITH RARE INTRAEPITHELIAL INTRANUCLEAR INCLUSION BODIES
6. BONE MARROW: MODERATE ERYTHROID HYPERPLASIA, WITH MYELOID LEFT SHIFT, AND MILD MEGAKARYOCYTIC HYPERPLASIA
7. EXTERNAL EAR CANAL: MULTIFOCAL HYPERKERATOSIS WITH INTRALESIONAL FUNGAL YEASTS (MALASSEZIA SP.)

COMMENTS:

high (400x) power field.



MICROSCOPIC DIAGNOSES:
1. NASAL TURBINATES: MULTIFOCAL TO COALESCING, ACUTE, NECROTIZING RHINITIS WITH INTRAEPITHELIAL INTRANUCLEAR INCLUSION BODIES
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7. EXTERNAL EAR CANAL: MULTIFOCAL HYPERKERATOSIS WITH INTRALESIONAL FUNGAL YEASTS (MALASSEZIA SP.)

COMMENTS:

Histopathological findings in this case are indicative of herpesvirus infection resulting in necrotizing rhinitis, adrenalitis, splenitis, and hepatitis causing death in this dog. An in-house PCR test for canine herpesvirus is positive from a portion of liver (PCR testing for canine herpesvirus is currently undergoing the later stages of validation). Testing for influenza, canine distemper virus, canine parainfluenza virus, and aerobic culture on sections of lung are negative.

Fatal systemic herpesvirus infection in adult dogs is uncommon, and usually associated with immunosuppression or stressful conditions, such as corticosteroid medication, chemotherapy, or surgery. In this case, there are a few factors that may be contributing to immune suppression. Steroid absorption from the ear medications, administration of some immune-modulating antibiotics (doxycycline, amikacin), and a bone marrow suppressive antibiotic (chloramphenicol) may have contributed in addition to stress from shelter housing and being sick. Additionally, systemic infection in puppies also involves thermoregulation. Because puppies are unable to thermoregulate, internal body temperatures can drop which allows improved replication of the virus and further suppression of the immune system allowing for severe systemic herpesvirus infection. It is noted a few times within the submitted medical records and histories that the rectal temperature was transiently low. It is also suggested that individual susceptibility may be important in disease pathogenesis. Whether the herpesvirus infection was acquired recently or was residing as a latent infection that recently recrudesced upon immune suppression or stress cannot be determined.

The lungs have a large amount of intra-alveolar edema and, to a lesser extent, fibrinous exudation indicative of diffuse alveolar damage (DAD), which often manifests clinically as acute respiratory distress syndrome (ARDS) and likely contributed to the acute changes documented in thoracic radiographic studies. Herpesvirus infection is the most likely inciting cause of ARDS in this case.

An underlying cause for the anemia is not determined in this case. One possibility is bone marrow suppression from administration of chloramphenicol. While some melena was detected on gross examination, a source of blood-loss into the gut was not identified.

No further tests are pending.

REFERENCE:
1. W.E. Hauser and J.S. Remington. Effect of Antibiotics on the Immune Response. American Journal of Medicine. 72(5). 1982.

Miranda D. Vieson, DVM, PhD, DACVP

## Microbiology

**Aerobic Culture** - Verified: 01/26/18 10:14 AM by MO3

| Specimen | Specimen Id | Iso# | Isolate | Result | Level |
|---|---|---|---|---|---|



| | | | |
|---|---|---|---|
| # 2 Lung | Cameo | No Bacteria Recovered | FINAL |

## Virology

**Canine Distemper (CDV) FA** - Verified: 01/25/18 11:48 AM by DC0

| Specimen | Specimen ID | Results |
|---|---|---|
| # 2 Lung | Cameo | Negative |

**Canine Parainfluenza Type 2 FA** - Verified: 01/25/18 11:48 AM by DC0

| Specimen | Specimen ID | Results |
|---|---|---|
| # 2 Lung | Cameo | Negative |

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## Microbiology

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| Specimen | Specimen Id | Iso# | Isolate | Result | Level |
|---|---|---|---|---|---|
| # 2 Lung | Cameo | | | No Bacteria Recovered | FINAL |



## Virology

**Canine Distemper (CDV) FA** - Verified: 01/25/18 11:48 AM by DC0

| Specimen | Specimen ID | Results |
|---|---|---|
| # 2 Lung | Cameo | Negative |

**Canine ParaInfluenza Type 2 FA** - Verified: 01/25/18 11:48 AM by DC0

| Specimen | Specimen ID | Results |
|---|---|---|
| # 2 Lung | Cameo | Negative |

**Influenza A matrix rRTPCR (lu)** - Verified: 01/25/18 4:55 PM by TE0

| Specimen | Specimen Id | Results |
|---|---|---|
| # 2 Lung | Cameo | 0.00 negative |