

# Diagnostic Exercise

## From The Davis-Thompson Foundation\*

Case #: 69 Month: June Year: 2016

### Answer Sheet

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**Gross morphologic diagnosis:** Lung, bronchointerstitial pneumonia, diffuse, subacute, severe (Figure 1).

**Other associated macroscopic lesions:** Footpad hyperkeratosis (Figure 3), enamel hypoplasia (Figure 4), growth retardation lattice (metaphyseal osteosclerosis).



**Figure 3** - Footpad hyperkeratosis.

**Figure 4** - Enamel hypoplasia.

**Histological description (Figure 2):** Lung: Diffusely, there is marked thickening of the alveolar septa due to histiocytic inflammatory infiltrate, more severely affecting peribronchiolar areas. Bronchiolar and more intensely alveolar lumens are filled with numerous foamy macrophages and syncytial cells. Some of these cells present round, 6-10  $\mu\text{m}$  diameter, intracytoplasmic and less frequently intranuclear eosinophilic inclusion bodies. In the bronchioles, some epithelial cells show tumefaction and hyper eosinophilia of the cytoplasm, as well as loss of cytoplasmic and nuclear detail (degeneration and necrosis of bronchiolar epithelium). There are also few small random foci with loss of definition of the alveolar walls, where pneumocytes are swollen and hyper eosinophilic (alveolar necrosis).

**Microscopic morphologic diagnosis:** Lung, bronchointerstitial pneumonia, necrotizing, subacute, diffuse, moderate, with syncytia and eosinophilic intracytoplasmic and intranuclear inclusion bodies.

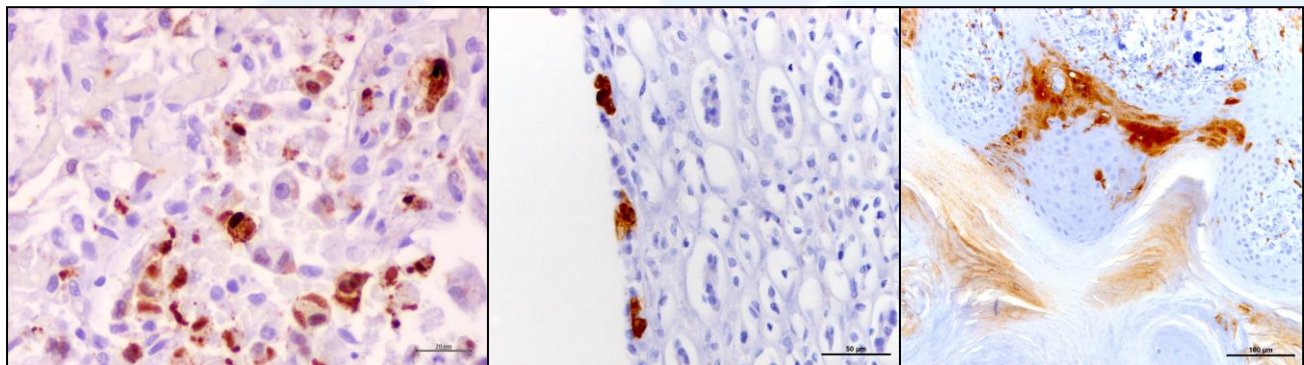
**Diagnosis:** Canine distemper.

**Etiology:** Canine distemper virus (CDV).

**Etiologic Diagnosis:** Morbilliviral pneumonia.

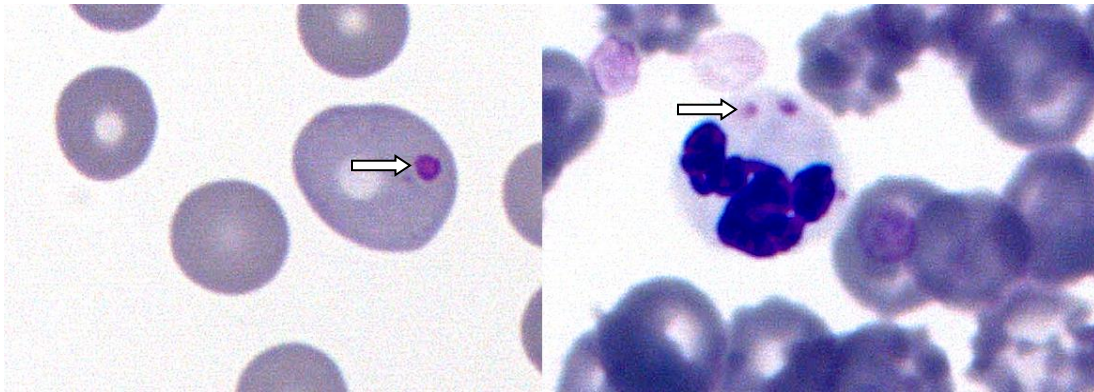
**Differential diagnoses for interstitial pneumonia in puppies:** Canine adenovirus (CAV2): presence of characteristic large, basophilic, intranuclear inclusion bodies. Canine herpesvirus (CHV1): presence of infrequent eosinophilic intranuclear inclusion bodies. Both viral infections lack intracytoplasmic inclusion bodies and syncytial cells.

**Two ancillary techniques to confirm your diagnosis:** PCR for CDV (whole blood, serum, cerebrospinal fluid, nasal/conjunctival swabs). Immunohistochemistry detection of viral antigens on paraffin-embedded tissue sections (Figures 5 through 7).



**Figure 5** (left) - Lung; **Figure 6** (middle) – Renal pelvis; **Figure 7** (right) - Footpad. Immunohistochemistry, DAB/Hematoxylin-counterstained.

**Other laboratory findings in this case:** Blood samples were collected and a complete blood count (CBC) with microscopic examination of a blood smear was performed. Round to oval, 2-3  $\mu\text{m}$  diameter, pink inclusion bodies were detected within the cytoplasm of erythrocytes (Figure 8) and neutrophils (Figure 9). This is a very characteristic feature occasionally observed in canine distemper.



**Figure 8** (left) – Erythrocytes, inclusion body (arrow); **Figure 9** (right) - Neutrophil, inclusion bodies (arrow). Peripheral blood smears, Wright-Giemsa, 100x objective.

**Discussion:** Canine distemper or Carré's disease is a ubiquitous infectious disease that affects wild and domestic canidae, wild felidae, mustelidae, and pinnipeds worldwide. Canine distemper virus (CDV) is an enveloped RNA virus that belongs to the genus Morbillivirus (Paramyxoviridae family). There is one recognized serotype and multiple strains with different pathogenicity and tissue tropism.

**Pathogenesis:** Natural transmission occurs by inhalation. In the pharynx, the virus is phagocytosed by mucosal lymphocytes (via recognition of the SLAM receptors of lymphocytes), macrophages, and likely dendritic cells. It then spreads via leukocyte trafficking to the tonsils, where new lymphocytes and macrophages are infected. Infected cells migrate through lymphatic vessels to regional lymph nodes and then spread systemically. Viremia, which lasts 4-8 days postinfection, results in rapid dissemination of the virus to other tissues and body secretions, including saliva, urine and feces. Infections of cells also occur via cell-free viremia through platelets. CDV infects a wide variety of epithelial and mesenchymal cells (pantropic virus), and kills these cells as it replicates and escapes from them. In the respiratory system, the virus kills pneumocytes, bronchiolar epithelial cells and alveolar macrophages (bronchointerstitial pneumonia). In the alimentary system, the virus kills enterocytes (and likely M cells) leading to diarrhea. The virus also gains access to ameloblasts during the development of the permanent teeth (enamel hypoplasia) and to osteoclasts of the bone growth plates (impaired bone resorption, growth retardation lattice). In the nervous system, the virus infects and replicates in vascular pericytes, perivascular astrocytic foot processes, neurons, microglial cells, as well as in choroid plexus epithelial cells. It then spreads to the cerebral spinal fluid (CSF) and infects ependymal cells and oligodendroglial cells in the subependymal white matter (polioencephalomalacia and demyelinating leukoencephalomalacia).

**References:**

Infectious Diseases of the Dog and Cat, 4th Edition. Craig E. Greene. Chapter 3, canine distemper, pages 25-42.

Pathologic Basis of Veterinary Disease, 5th Edition. James F. Zachary and M. Donald McGavin, Chapter 4, mechanisms of microbial infections, page 226-227.

Pathology of Domestic Animals, 6th Edition. Jubb, Kennedy & Palmer, 1: 104-105, 284-385, 474. 2: 116-117, 574-576, 575.

\*The Diagnostic Exercises are an initiative of the **Latin Comparative Pathology Group (LCPG)**, the Latin American subdivision of The Davis-Thompson Foundation. These exercises are contributed by members and non-members from any country of residence. Consider submitting an exercise! A final document containing this material with answers and a brief discussion will be posted on the CL Davis website ([http://www.cldavis.org/diagnostic\\_exercises.html](http://www.cldavis.org/diagnostic_exercises.html)).

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