

*Protecting Human and Animal Health*

**REPORT OF LABORATORY EXAMINATION**

Client:		Owner:	
White Shepherd Genetics Project (295483) Project PO Box 2068 Howell, MI 48844-2068 USA		White Shepherd, Genetics Project P.O. Box 2068  Howell MI -48844-2068	
Rec'd Date:	01/17/2006 01:47:00 PM	Animal:	CRYSTALSCHANCELLOR MRN:
Admitted By:	Not, Provided	Species:	Canine Breed: German Shepherd
Ordered By:	N/A	Age:	10 years Gender: Male, Castrated
Encounter:	00070880	Tag/Reg ID:	
CR#:	AP 601613462	Other ID:	

Addendum	Report
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Accession Number:	Received Date/Time:	Verified Date/Time:	Pathologist:
NC-06-0000212	01/17/2006 01:50:00 PM	05/26/2006 02:01:56 PM	Yamini, Behzad

**Additional Findings**

Sections of spinal cord (cervical, thoracic and lumbar) were microscopically examined. Within all sections of spinal cord, peripheral regions of dorsolateral tracts of lateral funiculi and ventromedial tracts of ventral funiculi exhibited a more pale eosinophilic staining pattern when compared to deeper portions of the white matter. A mild to moderate amount of lipofuscin accumulation was noted in neurons of the gray matter. Occasional spheroids within the gray matter were present.

Sections of spinal cord (cervical, thoracic and lumbar) were specially stained using the Luxol Fast Blue method. Within sections of caudal cervical spinal cord, low magnification revealed lighter blue staining of peripheral tracts in all funiculi when compared to deeper portions of white matter. Similar findings were noted in thoracic sections particularly in the dorsal, dorsolateral and ventral tracts. A spinal cord section containing the lumbosacral intumescence revealed sharply demarcated, faint blue staining within peripheral regions of the dorsal region on midline and dorsolateral funiculi.

**Diagnosis(es)**

**Spinal cord: degenerative myelopathy.**

**Comments:**

Although gross evidence of degenerative disc disease was present, sections of spinal cord did not contain histological lesions suggestive of focal spinal cord concussion or compression. Instead, within spinal cord sections stained with hematoxylin and eosin, subtle evidence of myelin sheath thinning was evident. Subsequent staining of cord sections with Luxol Fast Blue revealed a decrease in the intensity of myelin staining within peripheral regions of most funiculi, particularly in thoracic and lumbar sections. Myelin sheath thinning in the peripheral regions were particularly noticeable in the dorsal, dorsolateral, and ventral (midline) funiculi. This combination of histopathologic findings is most suggestive of a diagnosis of degenerative myelopathy.

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A test (called the DM Flash Test) is available to evaluate DNA of dogs suspected of having degenerative myelopathy. The link to the DM Flash test request form, located on Dr. Clemmon's website is: <http://neuro.vetmed.ufl.edu/DM-Flash-test.htm>.

Additional findings in this case included osteomalacia, primarily affecting costochondral junctions and the sternum. A reason for this is uncertain. Deformation of the chest apparently resulted from overgrowth of cartilaginous or osteoid tissue at the costochondral junction, and incomplete or failed calcification of this tissue, producing what resembled a "rachitic rosary" (as seen in rickets, a disease of growing animals). This type of skeletal disorder most often is related to a vitamin D deficiency, a disturbance in vitamin D metabolism, or disorders that disturb calcium or phosphorus homeostasis. Ante-mortem samples were not tested for calcium, phosphorus, vitamin D and/or parathormone levels, and thus we cannot determine the basis for this dog's osteomalacia. In the absence of gross and histologic evidence of a neoplastic disease (and possible hypercalcemia of malignancy) or chronic renal disease (with osteodystrophy), a likely scenario to consider would be insufficient intestinal absorption of vitamin D. The reported history indicated this dog suffered from chronic inflammatory bowel syndrome (and histopathology confirmed these findings), so perhaps this was related to vitamin D malabsorption.

Pierrette Danieu DVM, MS

Anatomic Pathology Resident

Jon S. Patterson, DVM, PhD, DACVP

(Electronically signed by) JSP

Verified: 05.26.2006 14:01

JSP /PKD

Necropsy	Preliminary	Report
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Accession Number: NC-06-0000212	Received Date/Time: 01/17/2006 01:50:00 PM	Verified Date/Time: 01/20/2006 09:09:14 AM	Pathologist: Yamini, Behzad
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## History

This 10 year old German Shepherd dog died on 1-17-2006. A detailed history is on file at the DCPAH.

## Gross Description

On external examination, this 110 lb. 10 year old neutered male German Shepherd dog was in an adequate nutritional and hydration state and was moderately autolyzed. A small white bandage encircled the proximal aspect of the left forelimb. Patchy areas of alopecia were noted on the elbows, bilaterally. A dark red, well-circumscribed and slightly moveable cystic structure was adherent to the connective tissue alongside the base of the pulmonary artery, most consistent with a hematocyst. The serosal surface of all liver lobes had an irregular and nodular surface contour. The

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serosal surface was further described as having linear to coalescing depressed areas that were intermixed with raised and smooth nodules of what appeared to be normal hepatic parenchyma. The pancreas was diffusely firm. The spleen was mildly enlarged and was slightly doughy in consistency. Stomach contents were a mixture of kibble, plant (grass) material and small irregularly-shaped pieces of pink to red plastic material. Areas of petechiation and ecchymoses were noted on the serosal surface of the small intestine. The colon was markedly distended with soft and unformed fecal material. The urinary bladder was markedly distended and contained approximately 2 liters of urine. All costochondral junctions located on the rib cage, as well as the xyphoid process, contained large, raised, irregularly-shaped, firm and white nodules. Similar lesions protruded from the ventral surface of the vertebral column. The ventral floor of the spinal canal, at the level of intervertebral spaces frequently contained raised and irregularly shaped protrusions, with the most severe lesion measuring 0.5 cm in diameter. Protruded disc spaces resulted in marked diminution of the vertebral canal space in those regions. Skeletal muscle bundles located randomly along the axial and appendicular regions were abnormally light tan to light pink. The articular surfaces, bilaterally, of the glenoid cavity of the scapula and the head of the humerus were diffusely roughened and contained focal and irregularly shaped areas of depressions. Numerous irregularly-shaped and smooth bone projections (osteophytes) extended from bone surrounded the affected joints. Similar lesions were noted in the coxofemoral joint, bilaterally. The major muscle groups of the hindlimbs, bilaterally were markedly atrophied resulting in very prominent hip and pelvic bones.

### Gross Diagnosis(es)

- 1) Axial skeleton, ribs and vertebrae: severe, chronic and multifocal **osteodystrophy** and intervertebral disc protrusion.
- 2) Joints, shoulder and hip, bilateral: severe, chronic degenerative joint **disease.**
- 3) Skeletal muscle: multifocal atrophy and degeneration.
- 4) Colon: megacolon.
- 5) Bladder: urinary bladder atony.
- 6) Liver: severe and nodular hepatopathy; diffuse hepatic congestion.
- 7) Pancreas: diffuse and chronic pancreatic fibrosis.

### Comments:

The most significant finding noted on gross examination were dystrophic changes noted in the rib cage, particularly at costochondral junctions. Numerous protrusions of firm/bony tissue at the level of disc spaces may be a result of degenerative disc disease or may be a manifestation of osteodystrophy similarly noted on the rib cage. The findings of urinary bladder atony, megacolon and muscle degeneration are typically noted in cases of spinal cord trauma and are in support of vertebral disease and intervertebral disc protrusion in this case. The presence of osteodystrophy is concerning as it is very suggestive of a condition termed, metabolic bone disease. Metabolic bone disease is typically associated with calcium deficiency. The underlying causes are many and include primary hypoparathyroidism, renal or nutritional secondary hyperparathyroidism, renal failure or intestinal malabsorption syndromes to name a few. In this case, there was no obvious gross evidence of kidney or parathyroid disease. However, in order to definitively elucidate the underlying cause for bone abnormalities, microscopic analysis of all major organs and affected tissues must be performed. Additional findings included severe liver disease. The appearance and distribution of hepatic lesions are very suggestive of chronic active hepatitis. The nodular appearance of the liver is typically noted in cases of hepatic cirrhosis. Regarding

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the pancreas, although color and shape were within normal limits, the consistency was diffusely firm and may be suggestive of chronic fibrosing pancreatitis. There was gross evidence of severe and chronic degenerative joint disease,

Necropsy	Preliminary	Report
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Accession Number: NC-06-0000212	Received Date/Time: 01/17/2006 01:50:00 PM	Verified Date/Time: 01/20/2006 09:09:14 AM	Pathologist: Yamini, Behzad
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particularly in the shoulder and hip joints. There was no obvious evidence of a concurrent neoplastic or infectious disease process. The peri-anal region was devoid of fistulous lesions. There was no gross evidence of active allergic skin or ear disease.

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Anatomic Pathology Resident

Behzad Yamini, DVM, PhD, DACVP

(Electronically signed by) BY

Verified: 01.20.2006 09:09

BY /PKD

Necropsy	Final	Report
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Accession Number: NC-06-0000212	Received Date/Time: 01/17/2006 01:50:00 PM	Verified Date/Time: 01/26/2006 07:40:46 AM	Pathologist: Yamini, Behzad
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### Microscopic Description

Sections of brain (cerebrum, cerebellum and caudal brain stem), heart, lung, liver, kidney, adrenal gland, spleen, pancreas, stomach, small intestine and colon were microscopically examined. Throughout sections of lung, interstitial spaces contained multifocal areas of mineralization. Sections of liver were characterized by mild to focally moderate and bridging fibrosis that extended along portal tracts and into hepatic parenchyma. The Glisson's capsule was moderately and diffusely expanded by fibrous connective tissue. Areas of fibrosis occasionally resulted in hepatic pseudobulbation and mild bile ductule proliferation. Periportal regions contained small populations of inflammation, primarily lymphocytes, plasma cells and lesser numbers of neutrophils. Aggregates of hemosiderin-laden macrophages were randomly scattered throughout hepatic parenchyma. The cytoplasm of hepatocytes, located throughout all hepatic regions, contained small, variably-sized clear vacuoles, consistent with vacuolar degeneration. Red pulp regions within sections of spleen contained moderate numbers of hemosiderin-laden macrophages. Within sections of kidney, renal glomeruli were mildly hypocellular and the mesangial matrix and Bowman's capsule were mildly thickened. Renal tubules were occasionally filled with an amorphous eosinophilic material. Cystic glomerular atrophy was infrequently noted. Sections of small intestine and colon contained similar findings consisting of moderate numbers of lymphocytes, plasma cells and eosinophils expanding the lamina propria of the superficial mucosa. Inflammation, particularly eosinophils extended to the level of villous tips or colonic crypts. Throughout all intestinal sections, superficial mucosal autolysis was present. Within sections of colon, ganglion present within the myenteric plexus were paucicellular and if present contained finely vacuolated cytoplasm.

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### Final Diagnosis(es)

- 1) Liver: mild to moderate periportal to bridging fibrosis with mild bile ductule proliferation and multifocal hemosiderosis; diffuse vacuolar hepatopathy.**
- 2) Small intestine: moderate, diffuse lymphoplasmacytic and eosinophilic enteritis.**
- 3) Colon: moderate lymphoplasmacytic and eosinophilic colitis.**
- 4) Spleen: moderate hemosiderosis.**
- 5) Kidney: mild membranous glomerulonephritis with cystic glomerular atrophy and proteinaceous casts.**

### Comments:

The most significant findings noted in this case were degenerative changes localized to the costochondral junctions of the rib cage and several areas where the disc protruded into the vertebral canal (particularly in the thoracolumbar and lumbosacral regions). In order to further classify these lesions, costochondral and vertebral specimens were collected and are currently undergoing decalcification in preparation for histologic analysis. Additionally, in order to document in greater detail degenerative and inflammatory changes likely present in the spinal cord, particularly in the thoracolumbar and lumbosacral regions, sections of spinal cord were submitted for histopathologic evaluation. These results, when available, will be released as a supplemental report. Finally, microscopic evidence of lymphocytic and eosinophilic enterocolitis was present and supports a diagnosis of inflammatory bowel disease in this case. Lesions noted within the liver, although very dramatic in appearance when examined grossly, were indicative of a chronic and smoldering process not uncommonly seen in older dogs. Microscopic evidence of primary pancreatic disease was not observed.

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