MICHIGAN STATE UNIVERSITY

DCPAH
Diagnostic Center for Population & Animal Health

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REPORT OF LABORATORY EXAMINATION

Client:
White Shepherd Genetics- (295483)
Project - Attn: Judy Huston
PO Box 2068
Howell, MI 48844-2068

Owner:
Harkness, Nancy
321 Plymouth NE
Grand Rapids MI 49503

Rcvd Date:	05/10/2010 04:14:00 PM	Animal:	SHATZ	MRN:	
Admitted By:	Not, Provided	Species:	Canine	Breed:	German Shepherd
Ordered By:	N/A	Age:	12 years	Gender:	Female
Encounter:	00988225	Tag/Reg ID:			
CR#:	AP C10166015	Other ID:			

Necropsy Preliminary Report

Accession Number:	Received Date/Time:	Verified Date/Time:	Pathologist:
NC-10-0000684	06/15/2010 01:21:00 PM	06/17/2010 11:38:39 AM	Patterson, Jon S.

History

A 13-year-old, spayed female white German Shepherd with a history of degenerative myelopathy and intervertebral disc disease was presented to the Michigan State University Veterinary Teaching Hospital for physical and neurological examination and euthanasia, and then was submitted to the DCPAH for full necropsy. Additional sampling was requested for degenerative myelopathy research at the University of Missouri. Additional history is on file at the DCPAH.

Gross Description

This is the body of a 32-kg, spayed female white German Shepherd in adequate hydration and fiar to good nutritional condition (BCS 6/9). The state of preservation is fresh. An indwelling catheter is present in the cephalic vein of the right forelimb; the catheter is held in place by bandage material.
There is moderate atrophy of lumbar epaxial muscles, and moderate to marked atrophy of muscle groups of both thighs. Scaly crusty skin is present over the bony protuberances of both elbows. Two rectangular shaved areas, each approximately 11x2 cm, are present on the right dorsal aspect of the thorax. Mild tartar is present on the teeth, and the gingiva is red in a thin (1 mm) line bordering most teeth.
A large (9x8x8-cm), hard, spherical mass bulges outwardly on the ventral aspect of the right rib cage. This mass is firmly attached to ribs 9-11. On cut surface, the mass is mottled yellow and white, and is rather multilobular with occasional cavitary areas. The white areas are brittle while outer portions of the mass are hard and rather cartilaginous.
The right medial and left lateral lobes of the liver contain single, raised, circumscribed, dark red, spherical, 2-cm in diameter masses. The hepatic parenchyma of the left lateral lobe is retracted such that the capsule is prominent and white in a 5-mm wide band. There are small (less than 1-6 mm in greatest dimension) random, round to irregularly shaped to linear, white areas (fibrosis) over all liver lobes, and the liver is generally firmer than normal. The tricuspid valve of the heart is moderately thickened and nodular. The spleen is moderately enlarged and slightly firmer than normal. Mild congestion is present in both kidneys. The stomach contains approximately 350 mL of yellow green fluid mixed with chunks of ingested food.
In the left stifle, there is a clear nylon suture which runs from the lateral trochlea of femur to the tibial crest. The joint capsule is markedly thickened (3 mm), white, and fibrous. The cartilage of medial meniscus is thinner than that of the

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lateral meniscus. In the right stifle, a suture is not found, but the medial meniscus is similarly thinned, and the joint capsule is more severely thickened (5-6 mm), compared to the left stifle.
On sagittal section, the caudal aspects of the vertebral bodies of C5 and C6 are more white than normal (osteopetrosis or osteosclerosis). There is a small dorsal bulge of intervertebral disc material between C6 and C7, and the disc material itself is attenuated and somewhat dry and flaky. There are multiple intervertebral joints with bony bridging between the ventral aspects of their vertebral bodies. This bridging spondylosis is present with various degrees of severity at C5-C6, C6-C7, T9-T10, T11-T12, T12-T13, T13-L1, L1-L2, and L2-L3. The most prominent thickenings are between L1-L2 and L2-L3. In multiple intervertebral joints, disc material is yellowish brown and rather dry and flaky (degenerate). Affected joints are T7-T8, T8-T9, T9-T10 and the L7-S.
The entire spinal cord is removed. Within the dura mater of the spinal cord, there are multiple flat plaques of gray red bone. The largest of these areas of dural ossification are over the C2 and C6 spinal cord segments, where the plaques are1-2 cm long and 4-5 mm wide. The spinal cord itself is grossly normal.

Gross Diagnosis(es)

Vertebral column: Multifocal ankylosing spondylosis
Multifocal intervertebral disc degeneration
Focal intervertebral disc protrusion (C6-C7)
Left and right stifles: Severe degenerative arthropathy
Hind limb and epaxial muscles: moderate to severe atrophy
Rib cage (right side): Focally extensive neoplasm (presumptive, see comments)
Liver: Moderate diffuse fibrosis, with lobular atrophy
Multifocal hepatomas (presumptive)
Heart: Moderate valvular endocardiosis (tricuspid valve)

Comments
The main gross lesions in this dog are degenerative joint disease along the vertebral column and degenerative arthropathy of both stifles. There is associated significant muscle atrophy of lumbar epaxial muscles and muscles of the thighs. It is unclear whether the mass on rib cage represents a healed fracture (bony callus) or a neoplasm. Histopathologic examination of organs and tissues, including the mass and extensive evaluation of the spinal cord, is in process and results will be described in the final report.

Chidozie J. Amuzie, DVM, PhD

Jon S. Patterson, DVM, PhD, DACVP

(Electronically signed by) JSP

Verified: 06.17.2010 11:38

JSP /CA

Necropsy Final Report

Accession Number:	Received Date/Time:	Verified Date/Time:	Pathologist:
NC-10-0000684	06/15/2010 01:21:00 PM	06/25/2010 04:39:30 PM	Patterson, Jon S.

History

Please see the previous report.

Gross Description

Please see the previous report.

Gross Diagnosis(es)

Please see the previous report.

Laboratory Findings

n/a

Microscopic Description

Sections of spinal cord (cervical, thoracic, lumbar, sacral, cauda equina), brain, spleen, pancreas, liver, thyroid gland, lung, kidney, skeletal muscles (quadriceps femoris and biceps femoris), small and large intestine, and rib cage mass were evaluated.

Multifocally and with various degrees of severity within the white matter in transverse and longitudinal sections of the spinal cord at all levels, myelin sheaths are dilated or fragmented, and several contain granular debris and/or 1-3 gitter cells. Luxol Fast Blue staining of multiple sections of spinal cord indicates loss or attenuation of myelin in peripheral white matter tracts, especially in dorsal, dorsolateral, and ventromedial tracts. Occasional axonal spheroids are present in areas of myelin degeneration. Myelin loss and attenuation is most severe in caudal thoracic and lumbar segments of the spinal cord. Dilation and fragmentation of myelin sheaths is most pronounced in the ventral funiculi of caudal lumbar and sacral spinal cord segments, and extending out into the nerve roots of the cauda equina. The examined spinal cord segments between the eleventh thoracic (T11) and fifth lumbar (L5) have lesions of mild to moderate severity with respect to dilation and fragmentation of myelin sheaths, while the segments representing the cervical cord show lesions of minimal to mild severity. In some thoracic and lumbar segments, these degenerative lesions are most striking in dorsal and dorsolateral aspects of the white matter. Multifocally through the spinal cord, neurons are laden with granules of gray brown pigment (likely lipofuscin).

There are multifocal areas of spinal dural ossification with occasional mineralization. Mineralization extends to the peripheral sheaths of nerve roots in lumbosacral segments. In sections of the cauda equina, peripheral nerves are multifocally surrounded and dissected by pale basophilic fibrillar material (Renaut bodies).

In the liver there is marked expansion of portal triads by fibrous tissue, with thin fibrous bands occasionally bridging affected portal areas. Thick bands of collagen surround bile ducts in the affected portal areas. Periportal sinusoids adjacent to the fibrotic bands are markedly congested. The capsule is thickened with fibrillar material (capsular fibrosis) multifocally within the section. Diffusely, there is moderate hepatocellular vacuolation with central nuclei, predominately in midzonal areas. Kupffer cells that are laden with brown amorphous pigments (pigment granulomas) are present multifocally within the hepatic parenchyma.

Within the spleen, red and white pulps are less prominent than normal. The fibromuscular trabeculae are accentuated, indicating splenic contraction. There are multifocal clusters of macrophages with amorphous globular brown intracellular pigment (hemosiderin).

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Diffusely within the kidney, glomerular basement membranes are thickened by eosinophilic material. There is rare, eosinophilic thickening of Bowman's capsule. Multifocally, the urinary space in renal corpuscles is distended by amorphous eosinophilic material, which compresses glomerular tufts. There is occasional adhesion of the glomerular tuft to thickened Bowman's capsule (synechiae). Moderate thickening of the interstitium by radial bands of fibrous tissue is also observed.
In a section of the lung, there are multifocal small aggregates of macrophages containing black to dark brown amorphous, granular material (anthracosis).
In sections of the quadriceps and biceps femoris there are variably sized (smaller) myofibers with moderate to marked infiltration of dissecting adipocytes. Some affected myofibers are hypereosinophilic and multifocally have thick, prominent contraction bands. Rarely, nuclear rowing is present.
Sections of the rib cage mass indicate a well circumscribed, irregular proliferation of neoplastic chondrocytes surrounded by a deeply basophilic matrix. These chondrocytes are ovoid to polygonal, variably sized and contained lacunae that often form large clusters. There are rare binucleate cells within lacunae. The edges of the neoplasm contain osteoid. There is an additional, more central island of osteoid surrounded by the chondroblastic proliferation. This osseous island has a small marrow cavity, suggesting an entrapped rib segment. Multifocally, deeply basophilic (mineralized) lakes are present within the proliferation. No mitotic figures are present in the section evaluated. No other lesions are seen in the sections evaluated.

Morphologic Diagnosis(es)

Spinal cord: Moderate to severe myelin degeneration and loss, with occasional axonal spheroids; moderate neuronal lipofuscinosis; multifocal dural ossification
Liver: Moderate to marked portal and periportal fibrosis with vacuolar hepatocellular degeneration
Lung: Multifocal anthracosis
Kidney: Mild diffuse membranous glomerulonephropathy; multifocal interstitial fibrosis
Skeletal muscle (quadriceps and biceps femoris): moderate to marked muscle atrophy, with adipocyte replacement
Rib cage mass: Chondrosarcoma (low grade)

Final Diagnosis(es)

Consistent with Degenerative Myelopathy

Comments:
The spinal cord lesions, particularly in caudal thoracic and lumbar segments, are consistent with Degenerative Myelopathy. The presence of moderately severe lesions in the caudal lumbar cord suggests the possibility of lumbosacral stenosis as well. There was no evidence of a compressive spinal cord lesion in the C5-C6 region despite the finding of a bulging, degenerative intervertebral disc at the site.
The pathologic changes in the liver indicate rather severe chronic disease, although apparently subclinical. The mass on the rib cage was diagnosed as a low-grade malignancy based on the presence of binucleate cells and rib invasion. Low-grade chondrosarcomas--though space-occupying masses--typically have benign biological behavior (i.e., unlikely to metastasize, limited tissue destruction).
Anthracosis refers to accumulation of inhaled carbon, and is environmentally related but of no clinical significance. The mild kidney changes are considered age-related.

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