

CASE NUMBER: 12/01426, PSU 12-02-110o

OWNER: PSU-DFO

VETERINARIAN: Dr. Stephen Raverty

DATE: Dec 17, 2012

MORPHOLOGIC DIAGNOSES:

- 1). Heart: Fibrosis, perivascular and interstitial, moderate, multifocal with occasional entrapment and replacement of myocardial fibers
- 2). Kidneys: Fibrosis, interstitial and perivascular, mild to moderate, multifocal with effacement and occasional peripheral entrapment of tubules
- 3). Liver: Biliary ductular hyperplasia, moderate, multifocal and occasionally bridging with periductular fibrosis and scattered cholestasis
- 4). Liver: Fibrosis, capsular, moderate, multifocal with projections into the parenchyma
- 5). Lymph nodes, multiple: Microcavitations, moderate, multifocal to coalescing with scattered mineralized precipitate
- 6). Lymph node, 1 of multiple: Lymphadenitis, moderate, multifocal to coalescing, suppurative with numerous microcavitations
- 7). Brain: Fragmentation, moderate, multifocal with occasional nodular aggregates of acicular clefts interspersed within a proteinaceous background
- 8). Stomach, junction of glandular and nonglandular compartments: Hyperplasia, squamous epithelia, moderate, multifocal with ortho and parakeratotic hyperkeratosis and transverse clefts and rare superficial, luminal nematode parasites
- 9). Stomach, glandular compartment, submucosa: Gastritis, mild to moderate, multifocal, nonsuppurative
- 10). Skeletal muscle, multiple sites: Proteinaceous fluid, endo and epimysial, moderate, variably extensive with numerous microcavitations and occasional myocellular hyalinization, fragmentation, vacuolation, central migration of nuclei and scattered endomysial lymphohistiocytic infiltrates and fibroplasia
- 11). Lung: Proteinaceous fluid, bronchoalveolar, moderate, multifocal (autolysis)
- 12). Spleen: Mineralized precipitate, moderate, multifocal, random with occasional serpiginous margins and tan brown marginal deposits
- 13). Skeletal muscle: Sarcocystosis, mild, random, multifocal
- 14). Dermis: Proteinaceous fluid, moderate, multifocal, perivascular and interstitial
- 15). Fascia, presumptive: Nematodiasis, encapsulated, moderate, multifocal to coalescing

There are no overt lesions within the brain, spinal cord, peripheral nerves, peripheral vasculature, heart, brain, spinal cord, vascular rete, pancreas, oropharynx, tongue, eye, optic nerve or adipose tissue.

COMMENTS:

Post mortem change hampered microscopic review of the sectioned tissues and precluded evaluation of multiple levels of bowel; a precise cause of death could not be determined by histopathology. Throughout multiple sections of lymph nodes, skeletal muscle, and other tissues, there are numerous microcavitations (emphysema) with occasional acellular to hypocellular proteinaceous fluid. Based on the lack of attendant hemorrhage, associated clostridial overgrowth, degree of autolysis and aspirated gas mass spectrometry findings from WHOI, the

emphysema is most likely associated with putrefaction, rather gas bubble disease. Based on the distribution and nature of the cavities, another differential may include fat embolization and results from special stains of the lung, brain and skeletal muscle are pending and to follow. The myocardial, hepatic and renal fibrosis are chronic and low to intermediate grade. Without antemortem clinical chemistries it is difficult to assess the impact of these changes to normal homeostasis. Myocardial fibrosis has previously been documented in adult stranded killer whales and may be attributed to long past toxic (domoic acid), heavy metal (mercury), infectious and other disease processes. PCR of the heart proved positive for Apicomplexa (NIH, Dr M Grigg); however, close evaluation of the myocardium did not reveal any discernible protozoa. In this case, the lack of grossly noted hydrothorax and ascites tends to discount cardiopulmonary compromise. The biliary ductular hyperplasia and periductular fibrosis is suggestive of an ascending infection from the gastrointestinal tract. Hepatobiliary trematodiasis and possible toxic insults may also be considerations. The fibrous connective tissue bands emanating from the liver capsule and projective to varying levels of the underlying parenchyma is unusual; this may represent a normal anatomic variation for the species, possible parasite migration tracts or some other entity. The overall impact on hepatobiliary function would be minimal. The reniculi appear small relative to the overall size of this animal; in regions, there are bands of fibrous connective tissue extending from the corticomedullary junction to capsule; randomly throughout the parenchyma, there are cords and trabeculae of moderately cellular fibrous connective tissue which efface and occasionally entrap individual tubules and glomeruli. Due to the chronicity of the lesions and lack of discernible pathogens, a specific etiology or pathogenesis could not be resolved. In 1 of multiple sections of brain, there is extensive fragmentation of the neuropil with scattered poorly delineated nodular aggregates of acicular clefts interspersed within varying amounts of proteinaceous material throughout the brain fragments; it is possible that this section may represent the grossly noted liquifactive change and fragmentation of the brain. The lack of associated hemorrhage, neuronolysis, edema fluid, fibrin deposition or inflammatory infiltrate suggests that this change may be due to freeze artefact and autolysis, rather than a distinct pathologic (or traumatic) process. The light growth of *Edwardsiella tarda* from the lung with moderate yield of alpha *Streptococcus* spp from the colon likely represent post mortem invasion and overgrowth as well as normal flora, respectively. Enrichment and selective culture for *Salmonella* and *Yersinia* did not feature any isolates and the lack of microbial growth from the brain, fluid, lung nodes, and spleen is likely related to putrefaction. Polymerase chain reaction (PCR) of pooled tissues proved negative for herpesvirus, Apicomplexa, *Brucella*, canine distemper virus, West Nile virus and influenza virus and trace mineral and vitamin A analysis of the liver proved largely within acceptable reference limits; the reduced calcium may be associated with the multisystemic fat saponification and mineral deposition. Due to the grossly noted hemorrhage and emphysema within the neck and head regions, immunofluorescence for Clostridial toxins was pursued and proved negative for *C chauvoei*, *C noyvi*, and *C sordelli*. The encapsulated nematodes are suggestive of *Crassicauda* spp and more precise speciation may entail consultation with a parasitologist. The gastric hyperkeratosis may suggest inappetence or anorexia and the luminal parasite is considered incidental. The chronic gastritis may suggest a source for the ascending cholangiohepatitis. Although the fluid accumulation within the lung was most likely due to autolysis, aspirated sea water, hemorrhage and erythrolysis and pulmonary edema may also be considerations. Variable amounts of debris were noted within the proteinaceous material and there were discernible heart failure cells. The suppurative lymphadenitis is consistent with a bacterial infection; involvement of 1 of multiple examined

lymph nodes suggests a localized process, either due to direct seeding of bacteria or draining infection. Imaging studies disclosed lesions consistent with a congenital anomaly in the cervical vertebrae; based on the condition of this animal, ability to swim and lack of asymmetric atrophy, it is likely that these changes were incidental to the immediate cause of death.

FINAL REPORT

Aerobic Culture - Prod Resulted by: Erin Zabek Verified by: Erin Zabek on 04/22/12 @ 9:06 AM

Specimen	ID	Isolate	Result	Level
Brain			No Bacteria Isolated	
Fluid	CSF		No Bacteria Isolated	
Tissue	Meninges		No Bacteria Isolated	
Lung		Edwardsiella tarda	Positive	1+
Lymph Node			No Bacteria Isolated	
Tissue	mammary gland		No Bacteria Isolated	
Swab	Blowhole		No Bacteria Isolated	
Spleen			No Bacteria Isolated	
Colon		Streptococcus sp. (alpha)	Positive	2+

Anaerobic Culture - Prod Resulted by: Jaime Osei-Appiah Verified by: Sean Byrne on 04/26/12 @ 11:42 AM

Specimen	ID	Isolate	Result	Level
Skin		Clostridium septicum	Positive	4+

Culture - Campylobacter Resulted by: Sean Byrne Verified by: Sean Byrne on 05/07/12 @ 4:02 PM

Specimen	ID	Isolate	Result	Level
Colon			Negative	

Culture - Yersinia Resulted by: Erin Zabek Verified by: Sean Byrne on 05/07/12 @ 3:38 PM

Specimen	ID	Isolate	Result	Level
Colon			No Yersinia sp. Isolated	

Culture - Salmonella Resulted by: Erin Zabek Verified by: Sean Byrne on 05/07/12 @ 3:38 PM

Specimen	ID	Isolate	Result	Level
Colon			No Salmonella sp. Isolated	

FA - *C. chauvoei* Resulted by: Erin Zabek Verified by: Sean Byrne on 04/19/12 @ 3:17 PM

Specimen	ID	Test	Result
Skin		FA - <i>C. chauvoei</i>	Negative

FA - *C. novyi* Resulted by: Erin Zabek Verified by: Sean Byrne on 04/19/12 @ 3:17 PM

Specimen	ID	Test	Result
Skin		FA - <i>C. novyi</i>	Negative

FA - *C. septicum* Resulted by: Erin Zabek Verified by: Sean Byrne on 04/19/12 @ 3:17 PM

Specimen	ID	Test	Result
Skin		FA - <i>C. septicum</i>	Negative

FA - *Clostridium sordelli* Resulted by: Erin Zabek Verified by: Sean Byrne on 04/19/12 @ 3:18 PM

Specimen	ID	Test	Result
Skin		FA - <i>Clostridium sordellii</i>	Negative

Molecular Diagnostics

Apicomplexa Resulted by: Ken Sojonky Verified by: Sean Byrne on 04/19/12 @ 4:07 PM

Specimen	ID	Test	Result
Tissue	brain & skin	Apicomplexa	Negative
**: Test validation in progress.			

Brucella spp. Resulted by: Julie Bidulka Verified by: Sean Byrne on 04/23/12 @ 3:46 PM

Specimen	ID	Test	Result
Tissue	sp.cord,lv,ln,s p,thy,mam.gl and	<i>Brucella</i> spp.	Negative
**: Test validation in progress.			

Canine Distemper virus Resulted by: Julie Bidulka Verified by: Dr. J. Robinson on 04/24/12 @ 3:51 PM

Specimen	ID	Test	Result
Tissue	sp.cord,lv,ln,s p,thy,mam.gl and	Canine Distemper virus	Negative

Influenza Virus-Consensus Resulted by: Julie Bidulka Verified by: Dr. J. Robinson on 04/23/12 @ 3:44 PM

Specimen	ID	Test	Result
Tissue	sp.cord,lv,ln,s p,thy,mam.gl and	Influenza Virus-Consensus	Negative

West Nile virus Resulted by: A Scouras Verified by: Dr. J. Robinson on 04/24/12 @ 10:26 AM

Specimen	ID	Test	Result
Tissue	sp.cord,lv,ln,s p,thy,mam.gl and	West Nile virus	Negative

Herpesvirus-Consensus Resulted by: Julie Bidulka Verified by: Dr. J. Robinson on 04/23/12 @ 4:38 PM

Specimen	ID	Test	Result
Tissue	sp.cord,lv,ln,s p,thy,mam.gl and	Herpesvirus-Consensus	Negative

** : Test validation in progress.

Toxicology

Phosphorus-Inorganic(Alcyon) Resulted by: Shawnee Landsiedel Verified by: Stephen Raverty on 06/08/12 @ 2:40 PM

Specimen	ID	Test	Level	Units	Range Low	Range High	Result
Liver		P	2.7	mg/dl			

Calcium-Tissue(AA) Resulted by:Shawnee Landsiedel Verified by:Stephen Raverty on 06/08/12 @ 2:40 PM

Specimen	ID	Test	Level	Units	Range Low	Range High	Result
Liver		Ca-t	2	ppm	50	200	<rang

Copper-Tissue(AA) Resulted by:Shawnee Landsiedel Verified by:Stephen Raverty on 06/08/12 @ 2:40 PM

Specimen	ID	Test	Level	Units	Range Low	Range High	Result
Liver		Cu-t	9	ppm	3.0	50.0	in range

Iron-Tissue(AA) Resulted by:Shawnee Landsiedel Verified by:Stephen Raverty on 06/08/12 @ 2:40 PM

Specimen	ID	Test	Level	Units	Range Low	Range High	Result
Liver		Fe-t	175	ppm	100	400	in range

Mercury-Tissue(AA) Resulted by:Shawnee Landsiedel Verified by:Stephen Raverty on 06/08/12 @ 2:40 PM

Specimen	ID	Test	Level	Units	Range Low	Range High	Result
Liver		Hg-t	12.4	ppm	0.1	30.0	in range

Manganese-Tissue(AA) Resulted by:Shawnee Landsiedel Verified by:Stephen Raverty on 06/08/12 @ 2:40 PM

Specimen	ID	Test	Level	Units	Range Low	Range High	Result
Liver		Mn-t	2.0	ppm	2.0	6.0	in range

Molybdenum - MO Resulted by:Shawnee Landsiedel Verified by:Stephen Raverty on 06/08/12 @ 2:40 PM

Specimen	ID	Test	Level	Units	Range Low	Range High	Result
Liver		mo	.28	ppm			

Selenium-Tissue(Flour.) Resulted by:Shawnee Landsiedel Verified by:Stephen Raverty on 06/08/12 @ 2:40 PM

Specimen	ID	Test	Level	Units	Range Low	Range High	Result
Liver		Se-t	5.18	ppm	0.30	20.0	in range

Cobalt - Tissue Resulted by:Shawnee Landsiedel Verified by:Stephen Raverty on 06/08/12 @ 2:40 PM

Specimen	ID	Test	Level	Units	Range Low	Range High	Result
Liver		Co-T	.009	ppm			

Magnesium-Tissue(AA) Resulted by:Shawnee Landsiedel Verified by:Stephen Raverty on 06/08/12 @ 2:40 PM

Specimen	ID	Test	Level	Units	Range Low	Range High	Result
Liver		Mg-t	213	ppm	100	250	in range

Zinc-Tissue(AA) Resulted by:Shawnee Landsiedel Verified by:Stephen Raverty on 06/08/12 @ 2:40 PM

Specimen	ID	Test	Level	Units	Range Low	Range High	Result
Liver		Zn-t	98	ppm	20	120	in range

Vitamin Package (Liver) Resulted by:Shawnee Landsiedel Verified by:Stephen Raverty on 06/08/12 @ 2:40 PM

Specimen	ID	Test	Level	Units	Range Low	Range High	Result
Liver		VitA-l	1844.4	ug/g			
Liver		VitE-t	829.2	ug/dl			

Staff Comments:

Toxicology testing performed by Prairie Diagnostic Services.