AFIP Wednesday Slide Conference 1984-1985

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Conf. #	Case #	Date of Conference	Contrib. #	AFIP #	Contributor	Species	Organ	Diagnosis
1	I	12 Sept 84	74032	1947456	Office of Biologics, FDA	Guinea pig	Uterus	Endometrial adenoma.
	II	"	6407	1901803	C.E. Kord An. Dis. Lab	Dog	Nasal mucosa	Polypoid rhinitis due to Rhinosporidium seeberi.
	III	"	832046	1947465	USAMRIID	Guinea pig	Lung	Pneumonia due to Legionella pneumophilia.
	IV	"	83-3533	1947998	Faculty of Veterinary Medicine, Quebec	Dog	Liver	Peliosis hepatis.
2	I	19 Sept 84	Syntex	1945668	Syntex Research	Cat	Subcutis	Pyogranulomatous inflammation due to an unidentified fungus.
	II	"	Path Br AFAMRL	1946316	AFAMRL/THP	Dog	Duodenum	Granulomatous enteritis due to Histoplasma capsulatum.
	III	"	84-4894	1946244	Livestock Disease Diagnostic Lab., Univ of Kentucky	Dog	Heart	Necrotizing myocarditis due to Prototheca sp.
	IV	"	LAIR 35638	1945809	LAIR	Penguin	Lung	Necrogranulomas, vasculitis and thrombosis due to Aspergillus sp.

3	I	26 Sept 84	82D128	1897187	Hershey Med. Center	Goat	Lung	Granulomatous pneumonia due to Muellerius sp.
	II	"	84437-6, -7, or -9	1947588	NADC, Ames Iowa	Steer	Small Intestine	Enteritis and ulceration due to BVD.
	III	"	84-0363	1947999	Oklahoma State Univ	Sheep	Kidney	Nephrosis due to oxalate toxicosis.
	IV	"	7042-3	1945250	Univ Nebraska	Bovine fetus	Abdominal peritoneum	Congenital mesothelioma.
4	I	3 Oct 84	A25704	1905203	Animal Medical Center	Dog	Vertebral body	Malignant neoplasm.
	II	"	00784	1946890	Univ Maryland	Dog	Pituitary gland	Chromophobe adenoma.
	III	"	83-2189I and II	1947253	USARICD	Kitten	Lung	Pleuropneumonia due to feline herpesvirus.
	IV	"	V82-487	1897382	Bushy Run Research Ctr.	Dog	Thyroid	Malignant mixed thyroid neoplasm.
5	I	10 Oct 84	MK84-848	1947596	Comp. Path, NIH	Monkey	Uterus	Periovarian endometriosis.
	II	"	BGSM 8171	1947391	Bowman Gray School of Med.	Monkey	Large intestine, liver	Necrotizing colitis and hepatitis due to Yersinia enterocolitica.
	III	"	N83-319	1900652	Univ Florida	Jaguar	Uterus	Papillary adenocarcinoma.
	IV	"	820698X	1852297	USAMRIID	Monkey	Jejunum	Eosinophilic granuloma due to Molineus sp.

6	I	17 Oct 84	X13790	1803451	Eli Lilly	Rat	Kidney	Nephroblastoma.
	II	"	84P-140	1946537	MD. Dept. Ag.	Parrot	Liver	Hepatitis due to Chlamydia psittaci.
	III	"	73862	1898516	Office of Biologics, FDA	Guinea pig	Kidney	Fibrosing interstitial nephritis.
	IV	"	QA84-011	1947579	Hazleton Labs	Mouse	Mammary gland	Adenoacanthoma.
7	I	24 Oct 84	62049	1945156	Texas A&M Univ	Dog	Liver, intestine	Granulomatous inflammation associated with eggs of Heterobilharzia americana.
	II	"	541	1947996	C.E. Kord An. Dis. Lab	Parrot	Liver	Hepatic necrosis due to reovirus.
	III	"	-	1948264	Univ of Penn	Dog	Liver, spleen	Hepatic amyloidosis, splenic AFB due to M. avium.
	IV	"	39326N	1944525	Auburn Univ	Cat	Cerebrum	Polioencephalitis due to Candida albicans.

8	I	31 Oct 84	83-1606-3	1944384	Virginia Tech	Cat	Bile duct	Leiomyosarcoma (Contributor's DX: Carcinosarcoma).
	II	"	83-230	1948535	NC State Univ	Cat	Cerebrum	Periventriculitis and leptomeningitis due to FIP (coronavirus).
	III	"	84-1680	1944299	Ohio State Univ	Dog	Perirectal soft tissue	Adenocarcinoma of apocrine glands of the anal sac.
	IV	"	N20820A	1902445	Univ Minnesota	Dog (Basenji)	Kidney	Cortical fibrosis and papillary necrosis; Fanconi-like syndrome.
9	I	7 Nov 84	82-0011	1950246	Microbiological Associates	Mouse	Lung	Bronchiolitis & pneumonitis due to Sendai virus (paramyxovirus).
	II	"	84488	1947581	NADC, Ames, Iowa	Bovine	Lung	Fibrinocellular pneumonia due to Pasteurella multocida.
	III	"	72890	1849470	NCDB,FDA	Monkey	Skin, lung	Chondrosarcoma.
	IV	"	84-5644	1947594	Auburn Univ	Gamebird	Lung	Granulomas and granulomatous parabronchitis due to Cytodites nudus.

10	I	28 Nov 84	73450	1947395	Ontario Ministry Ag., Guelph	Bovine fetus	Placenta, lung	Placentitis and pneumonia due to *Ureaplasma* sp.
	II	"	HB4-I	1946321	An. Indust. Res. Inst., Taiwan	Pig	Kidney	Fibrinous glomerular thrombosis due to *Erysipelothrix rhusiopathiae*.
	III	"	83PD11523	1949349	Colorado State Univ	Bovine	Kidney	Tubular necrosis due to oxytetracycline toxicity.
	IV	"	84-3219	1948306	British Columbia Vet. Lab.	Pig	Tongue	Ulcerative glossitis due to poxvirus.
11	I	5 Dec 84	AC-249-85	1951858	Purdue Univ	Canary	Small intestine, liver, lung	Histiocytic enteritis, pneumonia, and hepatitis due to *Isospora serini*.
	II	"	84-P-671	1945658	Iowa State Univ	Pig	Lung	Fibrinonecrotic bronchopneumonia due to *Herpes suis* (pseudorabies).
	III	"	408 U	1902460	Lovelace Inst.	Dog	Lung	Alveolar & interstitial microlithiasis; Cushing's disease.
	IV	"	R-1484-81	1946346	SmithKline & French	Rat	Lung, liver	Histiocytic sarcoma.

12	I	12 Dec 84	84-874	1944302	Ohio State Univ	Calf	Spinal cord	Infarct of the gray matter due to trauma.
	II	"	84-P-724	1945671	Iowa State Univ	Sheep	Brainstem	Neuronal degeneration and vacuolation due to scrapie.
	III	"	83-287 A&B	1948533	NC State Univ	Dog	Cerebrum, cerebellum	Parenchymal cavitation and neuronal cell loss due to severe ischemia.
	IV	"	A83-305	1901526	Angell Mem. Animal Hosp	Cat	Cerebrum	Ependymoblastoma.
13	I	19 Dec 84	8281;83;97 8336;57	1947713	Procter and Gamble Co	Rat	Oro-nasal cavity	Hyperostosis of cranial bones and ameloblastic dysplasia due to fluorosis.
	II	"	84-2043	1947994	Univ of Airzona	Chicken	Heart	Granulomatous myo-carditis due to Salmonella pullorum.
	III	"	84-8223	1948001	Oklahoma State Univ	Bovine	Heart, skin	Granulomatous myo-carditis and dermatitis due to hairy vetch toxicosis.
	IV	"	1164	1849453	Univ of Illinois	Calf	Lymph node, liver, spleen	Necrotizing hepatitis, splenitis, and lymphade-nitis due to bovine adenovirus.

14	I	9 Jan 85	1101907-2 & 3	1945148	Fredrick Cancer Research Ctr	Rat	Lung	Granulomatous interstitial pneumonia due to Pneumocystis carinii.
	II	"	S83-1111	1947995	Mississippi State Univ	Dog	Liver	Necrotizing hepatitis due to Bacillus piliformis (Tyzzer's disease).
	III	"	12-07539 12-07537	1945165	Fredrick Cancer Research Ctr	Mouse	Lung	Papillary and solid adenocarcinoma.
	IV	"	r-82-634	1947842	Sterling-Winthrop	Rat	Vertebral body, liver	Stem cell neoplasia.
15	I	16 Jan 85	84-242	1945160	Univ of Liverpool	Dog	Pharynx	Mucocele.
	II	"	83-199	1900660	Procter and Gamble Co	Dog	Larynx	Onchocytoma.
	III	"	R80-120	1902454	Animal Indust. Res. Inst., Taiwan	Pig	Uterus	Necropurulent endometritis due to Staphlococcus sp.
	IV	"	84D842-1	1943462	Hershey Med. Center	Macaque	Skin	Hyperkeratosis and acanthosis due to Psorergates sp.

16	I	23 Jan 85	N84-0210	1944522	Brooks AFB	Rat	Salivary gland	Dacryoadenitis due to SDAV (coronavirus).
	II	"	83P-227	1946538	MD. Dept. Ag.	Horse	Lung	Granular cell tumor.
	III	"	D83-533	1948327	Cornell Univ	Bovine	Nerve, (brachial plexus)	Bovine neurofibromatosis.
	IV	"	81-1810-6	1913616	Kansas State Univ	Horse	Tongue	Ulcerative glossitis due to Gastrophilus sp.
17	I	30 Jan 85	83-781	1949058	National Zoo	Boa	Stomach	Proliferative gastritis due to Cryptosporidia sp.
	II	"	83-779	1949062	National Zoo	Camel	Lung	Multifocal pyogranulomas due to Mycobacterium bovis.
	III	"	U. of S. Vet Path	1947498	Univ of Saskatchewan	Duck	Liver	Multifocal hepatic necrosis due to duck plague (herpesvirus).
	IV	"	83-102-1	1910131	Univ of Texas Med. School	Bird of Paradise	Liver	Hepatitis and intrahepatocellular pigment due to iron storage disease.

18	I	6 Feb 85	ON83/2380	1950123	Ag. Res. & Vet Ctr. NSW, Aust.	Bovine	Lung,	Protozoal schizonts due to Sarcocystis sp.
	II	"	BGSM 8120	1947389	Bowman Gray Med. School	Monkey	Kidney	Membranoproliferative glomerulonephritis.
	III	"	N84-556	1947696	Univ of Florida	Dog	Skin	Granulomatous dermatitis due to Leishmania sp.
	IV	"	XMC2049	1948730	Lilly Res. Labs	Rat	Lung	Mast cell tumor; pyogranulomatous bronchopneumonia suggestive of Mycoplasma pulmonis.
19	I	13 Feb 85	84-0001	1949421	Dow Chemical Company	Rat	Testis	Interstitial cell tumor and mesothelioma.
	II	"	4-232-34E	1962597	Div. Vet. Med. Res., FDA	Dog	Thyroid	Lymphocytic thyroiditis (Hashimoto's-like disease).
	III	"	8-223-80	1953401	Montana Vet. Diag. Lab.	Beaver	Liver	Necrotizing hepatitis due to Francisella tularensis.
	IV	"	R-1169-81	1946348	Smith Kline & French	Rat	Zymbal's gland	Zymbal's gland carcinoma.

20	I	20 Feb 85	84-406	1947706	Pfizer	Rat	Lung	Necrosuppurative pneumonia due to Corynebacterium kutcheri.
	II	"	83-3909	1948304	British Columbia Vet. Lab.	Horse	Liver	Cirrhosis with megalocytosis due to Senecio sp toxicity.
	III	"	S11961	1955904	Merck Sharp & Dohme	Sheep	Liver	Necrosis and hepatitis; probably due to copper & pyrrolizidine alkaloid toxicosis.
	IV	"	85-1	1948310	Bio/dynamics	Rat	Preputial gland	Preputial gland carcinoma.
21	I	27 Feb 85	HLA-2	1899058	Hazelton Labs.	Dog	Liver	Hepatitis with cysts containing eggs of Capillaria hepatica.
	II	"	84-0002	1949426	Dow Chem. Co.	Rat	Uterus	Contributor's DX: Malignant schwannoma. AFIP DX: undifferentiated sarcoma.
	III	"	10419-84	1946396	Univ of Missouri	Cat	Liver	Cirrhosis due to extrahepatic bile duct obstruction.
	IV	"	HLA-1	1899158	Hazelton Labs.	Mouse	Harderian gland	Harderian gland adenocarcinoma.

22	I	13 Mar 85	83-2671	1957380	Onderstepoort Res. Lab.	Bovine	Skin	Granulomatous dermatitis due to Besnoitia sp.
	II	"	V84-754	1947839	New Mexico Vet. Diag. Svcs.	Lion	Lung, liver	Pyogranulomatous pneumonia & necrogranulomatous hepatitis due to Salmonella sp.
	III	"	83/1653	1950116	Regional Vet Lab, NSW, Aust.	Bovine	Spleen, liver	Splenic congestion, hepatic thrombosis, due to Bacillus anthracis.
	IV	"	RWM-B 8-84	1947392	Div. Pathol, FDA	Cat	Liver	Cholangiocarcinoma.
23	I	20 Mar 85	84/2000	1956094	Palmerston North Anim. Lab., New Zealand	Lamb	Tongue	Erosive, pustular glossitis due to contagious ecthyma (parapoxvirus).
	II	"	81-1995 B&C	1947250	USAMRICD	Goat	Abomasum	Contributor's DX: Gastric carcinoid. AFIP DX: Malignant neoplasm.
	III	"	-	1964885	WRAIR	Monkey	Blood	Erythroparasitemia due to Plasmodium sp.
	IV	"	81-592	1900952	Virginia Tech.	Turkey	Cerebrum	Granulomatous meningoencephalitis and necrogranulomatous ventriculitis due to Salmonella arizonae.

24	I	3 Apr 85	84N143	1947882	Univ Wisc.	Dog	Omentum	Omental pyogranulomas due to porcupine quills.
	II	"	HLA8424	1948733	Hazelton Labs.	Calf	Thyroid	Hyperplastic goiter.
	III	"	-	1942619	10th Med. Lab.	Dog	Small intestine	Extraskeletal osteosarcoma.
	IV	"	84-91	1948878	Murdoch Univ	Dog	Kidney	Necrogranulomatous nephritis due to Aspergillus terreus.
25	I	10 Apr 85	82/9169	1949348	Palmerston North An. Lab., New Zealand	Ferret	Cerebrum	Necrogranulomatous meningoencephalitis and ventriculitis due to Aspergillus terreus.
	II	"	48724	1897832	Ontario Min. of Ag. & Food	Dog (Doberman)	Heart	Myocardial degeneration and fibrosis.
	III	"	84-2174	1948332	Univ of Arizona	Dog	Heart	Coronary aterial atherosclerosis.
	IV	"	19144	1947453	Johns Hopkins Univ	Monkey	Heart,	Diffuse ceroid-lipofuscinosis.

26	I	17 Apr 85	82-437	1983084	National Zoo	Cormorant	Bone	Dyschondroplasia (rickets).
	II	"	P1550A, P1557A, P1558A	1948317	Univ Minn.	Chicken	Bone	Tibial dyschondroplasia due to Fusarium sp toxicosis.
	III	"	20228-32	1947452	Johns Hopkins Univ	Dog	Maxilla, turbinates	Fibrous osteodystrophy secondary to renal cortical disease.
	IV	"	084-8	1948322	Cornell Univ	Pig	Maxilla, Turbinates	Fibrous osteodystrophy secondary to nutritional deficiency.
27	I	1 May 85	84-396	1966713	Univ of Penn.	Groundhog	Skin	Cutaneous dermatophilosis.
	II	"	V84-241, -375	1945775	Bushy Run Research Ctr.	Dog	Skin	Nodular panniculitis.
	III	"	V84-4206	1947831	New Mexico Vet. Diag. Svcs.	Cat	Skin	Pemphigus foliaceus.
	IV	"	A84-75	1947834	Angell Memorial Animal Hosp.	Cat	Skin	Carcinoma with basaloid and hair follicle differentiation (contributors DX: Malignant basal cell tumor).

28	I	8 May 85	80650	1910089	Texas A&M	Horse	Pancreas	Eosinophilic & fibrosing pancreatitis due to migration of Strongylus equinus.
	II	"	4265-83	1894683	Oregon State Univ	Horse	Ovary	Granulosa cell tumor.
	III	"	83-1155B	1941253	Univ of Penn, New Bolton Ctr.	Chicken	Pancreas	Necrotizing pancreatitis due to avian influenza (orthomyxovirus).
	IV	"	N83-852	1902492	Univ of Saskatchewan	Horse	Small intestine	Eosinophilic granulomatous enteritis.
29	I	15 May 85	83-105	1899159	Univ of Penn, New Bolton Ctr.	Horse	Bone marrow	Myeloproliferative disease consistent with eosinophilic leukemia.
	II	"	2988-84	1946317	Oregon State Univ	Horse	Small intestine	Clostridium perfringens enterotoxemia.
	III	"	83-581	1957368	Vet. Res. Inst. Onderstepoort	Horse	Skin	Eosinophilic and granulomatous, ulcerative dermatitis due to Habronema sp.
	IV	"	N-84-343	1947992	Mississippi State Univ	Horse	Testis	Normal physiologic testicular involution in the neonatal foal.

30	I	22 May 85	HD836440	1945169	Vet. Ref. Lab. Utah	Dog	Mammary gland	Basaloid adenoma.
	II	"	75N-1446	1902435	Univ of Calif., Davis	Dog (Bernese mountain)	Dermis, subcutis	Angiocentric chronic-active dermatitis and cellulitis; systemic histiocytosis.
	III	"	393-84	1946318	Oregon State Univ	Calf	Liver, spleen, kidney	Subacute hepatitis, splenitis, and nephritis due to epizootic bovine abortion (foothill abortion).
	IV	"	CP 84-29	1948004	Southwest Med. School	Cat	Lung	Granulomatous pneumonia due to Paragonimus sp.

Results
AFIP Wednesday Slide Conference - No. 1
12 September 1984

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Case I - 74032 (AFIP 1947456).

History. Incidental finding in a 3-year-old Hartley guinea pig; grossly there was a white, 5x5 mm nodule in the wall of the uterus which protruded into the lumen.

Contributor's Diagnosis. Endometrial adenoma.

AFIP Diagnosis. Adenoma, endometrium, uterus, Hartley guinea pig, rodent.

Comment. Some tissue sections lacked outer myometrial layers with prominent interposed vasculature, or areas of normal endometrium, making tissue identification difficult. The myometrium was somewhat attenuated suggesting the smooth muscle was stretched due to expansion of the tumor. Although the mass was well-differentiated and hyperplastic in appearance, a diagnosis of adenoma was preferred based upon the size of the mass, its focal nature, and attempts at encapsulation. A differential diagnosis of adenomyosis (endometriosis interna) can be ruled out due to lack of a stromal component in this neoplasm. Spontaneous neoplasms in the guinea pig are rare -- their incidence being one of the lowest among all laboratory animal species. Of those reported, uterine tumors are rarely mentioned and, when described, are usually sarcomas. Adenocarcinomas, adenomatous polyps, and adenomyomas have been described (Blumenthal & Rogers, 1960) (Lipschutz, 1959). The paucity of spontaneous neoplasms in the guinea pig, and their resistance even to experimental induction, is thought to be due to a factor in their serum, which, when introduced into mice, inhibits the growth of lymphomas (Blumenthahl & Rogers, 1965).

Contributor. Office of Biologics, Center for Drugs and Biologics, Food & Drug Administration, 8800 Rockville Pike, Bethesda, Maryland 20205.

Suggested reading.

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Case II - 6407 - (AFIP 1901803).

History. A nasal biopsy was submitted from a 7-year-old female German shepherd dog. The dog had been presented for intermittent sneezing of 2-3 weeks duration. The vaccinations were up to date and she was in good physical condition. A 6 mm diameter polypoid nodule was submitted for histologic examination.

Contributor's Diagnoses. 1) Rhinitis, suppurative, chronic with mucosal hyperplasia and squamous metaplasia, due to Rhinosporidium seeberi. 2) Microfilariasis, presumably due to Dirofilaria immitis infection.

AFIP Diagnoses. 1) Rhinitis, polypoid, chronic-active, focal, moderate, with numerous stromal fungal sporangia and moderate epithelial hyperplasia and squamous metaplasia, nasal mucosa, German shepherd, canine; etiology - Rhinosporidium seeberi. 2) Microfilaremia, nasal mucosa.

Comment. The excised nasal polyp is characterized by intense submucosal infiltrates of neutrophils, plasma cells, and macrophages containing hemosiderin. Numerous sporangia which have thick birefringent walls and measure up to 300 microns in diameter are present in the submucosa. Sporangia vary from smaller, trophic stages to large mature forms containing numerous endospores. An intense neutrophil response is associated with the release of endospores. Neutrophils are traversing the hyperplastic mucosa which in some areas has undergone squamous metaplasia. Fibrosis and hyperemia of the submucosa are evident, as are microfilariae in many sections. The differential diagnosis includes Coccidioides which also undergoes endosporulation but generally has smaller spherules than the sporangia of Rhinosporidium. Adiaspores of Emmonsia spp. have much thicker walls, lack endospores, and are generally restricted to the lung. In Besnoitia infections the compressed host cell nucleus is readily apparent.

Rhinosporidiosis is a rare disease in the U.S. affecting cattle and horses primarily in the Gulf States. In India and Ceylon where it is a common disease in man, infection may occur through breaks in mucous membranes. Infection of the nasal mucosa frequently results in polyp formation which may occlude nasal passages. Systemic infection is rare.

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Suggested reading.

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Case III - 832046 (AFIP 1947465).

History. Groups of 400-gram male Hartley guinea pigs were exposed to a human infectious agent via aerosol inoculation. Animals were killed at 3 days post-inoculation (pi) and 7 days pi. At 3 days pi the lungs collapsed partially and had multiple nodular foci scattered throughout. At 7 days pi the lungs failed to collapse and had disseminated to diffuse consolidation.

Laboratory Results. The infectious agent was routinely isolated by culture from necropsy specimens of lungs, lymph nodes, and spleen.

Contributor's Diagnoses. 1) Pneumonia, fibrinopurulent, acute, multifocal, minimal to mild, lung, guinea pig (3 dpi). 2) Pneumonia, fibrinopurulent, subacute, diffuse, severe, lung, guinea pig (7 dpi); etiology - Legionella pneumophilia (Philadelphia L-1 strain).

AFIP Diagnoses. 1) Pneumonia, suppurative, multifocal, minimal to mild, lung (3 days pi), Hartley guinea pig, rodent. 2) Pneumonia, fibrinosuppurative, subacute, diffuse, moderate to severe, with segmental bronchiolar epithelial hyperplasia and squamous metaplasia, lung (7 days pi); etiology - consistent with Legionella pneumophilia.

Comment. Among lung sections of the same stage of disease, there was variation in the distribution and/or severity of the lesions and in the amount of fibrin present in alveoli. The organisms were not readily identifiable on H&E, Gram stains, or immunofluorescent stains applied in the contributor's laboratory or at the AFIP; in the contributor's experience, this is usually the case with formalin-fixed tissue. The experience with human cases at the AFIP is that organisms are readily seen on H&E within phagolysosomes of macrophages or free within areas of leukocytoclasis; these findings are not characteristic of the disease in guinea pigs. At the AFIP the Brown and Hopps Gram stain is preferred to silver stains such as the Dieterle, which is the preferred stain in at least one major diagnostic laboratory.

Pneumonia caused by Legionella pneumonia tends to be more suppurative in the guinea pig than in man (in man the pneumonia is frequently termed "histiocytic"). The pneumonia in both species classically involves only respiratory bronchioles and alveoli; it has been suggested that L. pneumophilia has little affinity for columnar epithelial cells or mucous surfaces, and that this may be due to a lack of necessary molecular adherence mechanisms (Baskerville et al.).

Ultrastructural studies suggest that guinea pig neutrophils kill L. pneumophilia, but that the organism thrives and replicates in macrophages. Bacilli have also been seen closely associated with a membranous organelle resembling rough endoplasmic reticulum; the signficance of this is unclear. An electron photomicrograph of this case (to be forwarded) shows viable bacilli and a degenerate neutrophil within an alveolar macrophage. Surrounding the macrophage are other degenerate neutrophils, and proteinaceous material.

Despite dissimilarities between L. pneumophilia infection in man and the guinea pig, Winn states that the latter provides a good model for the susceptible human host (immunosuppressed or cigarette smoker), while the rat may provide an equally good model of the relatively resistant human host.

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Suggested reading.

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Case IV - 83-3533 (AFIP 1947998).

History. Liver from a 14-year-old, male beagle dog, which had autoimmune hemolytic anemia and was euthanatized. In the liver of this dog there were many tiny dark red spots visible on both the visceral and cut surfaces.

Contributor's Diagnosis. Peliosis hepatis-like lesion.

AFIP Diagnosis. Peliosis, multifocal, moderate, with multifocal thrombosis, mild micronodular hemosiderosis and biliary stasis, liver, beagle, canine.

Comment. Peliosis hepatis has been reported in the cat, in aged rats, in rats experimentally infected with a leukemia virus, in cattle with St. George disease (associated with the plant Pimelea), and in man. The condition in man has been linked to chronic wasting disease, to include tuberculosis and neoplasia, and with therapeutic doses of 17-alpha-alkylated steroids to include anabolic and contraceptive steroids. The two types of peliosis hepatis can be differentiated by the presence or absence of an endothelial-lined membrane surrounding the blood-filled cavity. Ultrastructurally, dilatation of both the space of Disse and/or the sinusoidal lumen are seen, and occasionally passage of red blood cells through the endothelial barrier of the sinusoids can be demonstrated. These findings suggest that alterations of the sinusoidal barrier are primary events in peliosis.

This condition must differentiated in cattle from telangiectasis which is a dilatation of functional blood vessels, and in dogs from changes related to post-caval syndrome as a result of D. immitis infection. Extrahepatic peliosis has also been reported.

In this case, there was only an occasional endothelial cell or membrane lining the blood-filled spaces. The contributor reported seeing this condition in several other dogs with autoimmune hemolytic anemia. Attendees speculated that such lesions could have resulted from hypoxia secondary to anemia, or possibly from steroid therapy (androgens to stimulate erythropoiesis, or glucocorticoids to counter autoimmune disease) had such therapy been instituted.

Contributor. Department of Pathology and Microbiology, Faculty of Veterinary Medicine, C.P. 5000, St.-Hyacinthe, Quebec, Canada J2S 7C6.

Suggested reading.

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Results
AFIP Wednesday Slide Conference - No. 2
19 September 1984

Conference Moderator: George Migaki, D.V.M.
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Case I - Syntex - (AFIP 1945668).

History. Tissue from a 4-year-old, DLH, female, cat. One year prior to removal of this tissue, a cutaneous cyst appeared on the nose. The cyst was aspirated at three-month intervals until it was surgically removed because of invasion into the right nostril.

Contributor's Diagnosis. Mycotic granuloma - Cryptococcus neoformans.

AFIP Diagnosis. Inflammation, pyogranulomatous, focally extensive, severe, with intra- and extracellular yeasts, subcutis, nose, domestic long hair, feline.

Comment. On H&E sections, the yeasts are thin-walled and some are surrounded by a variably-wide clear space suggestive of a capsule. The yeasts occasionally are weakly carminophilic and stain weakly with alcian blue. A GMS stain demonstrates the yeasts to have narrow-based budding to form short chains and occasionally pseudohyphae and/or germ tubes. As a differential diagnosis, Cryptococcus and Blastomyces are worthy of initial consideration. The capsule of Cryptococcus is generally thought to be strongly carminophilic in animal tissues, yet CDC has found in the past 4 years that 15% of their cases are not mucicarminophilic. Pseudohyphae and germ tubes are occasionally seen in cryptococcal infections (Chandler, Kaplan, Ajello, 1980). The inflammatory response in this case is more typical of Blastomyces but the yeasts should have thick, double-contoured walls and broad-base budding. Also, their walls can rarely be carminophilic, and pseudohyphae and germ tubes are occasionally seen. Alternaria spp. and other fungi were also considered. Although Alternaria has been cultured from several cases of facial mycosis in cats, the unstained sections were not thought to be naturally pigmented.

Evaluation by fluorescent antibody techniques at CDC were negative for Cryptococcus sp. Similar evaluation for Blastomyces sp. has not been completed. The mycology Division at CDC thinks that morphologically the fungus most closely resembles a Phaehyphomycete. They see light pigmentation (compatible with a dermatiaceous fungus) and pleomorphic hyphal fragments and germ tubes and some pleomorphic yeasts. This fungal morphology coupled with the tissue response is similar to several cases of Drechsleria and Alternaria they have seen. Further evaluations are being made, yet without a culture of the causative organism, a definitive diagnosis cannot be made.

Contributor. Syntex Research, 3401 Hillview Ave., Palo Alto, California 94304.

Suggested reading.

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Case II - Path Br AFAMRL (AFIP 1946316).

History. Tissue from a dog.

Gross Findings. This animal had generalized lymphadenopathy, but lung involvement was not seen.

Contributor's Diagnosis. Duodenitis, granulomatous, segmental, severe, duodenum, canine, basset; etiology - compatible with Histoplasma capsulatum.

AFIP Diagnosis. Enteritis, granulomatous, transmural, multifocal, severe, with numerous intracellular yeasts, small intestine, basset hound, canine; etiology -- compatible with Histoplasma capsulatum.

Comment. Pulmonary disease is the most common form of infection by Histoplasma capsulatum. Primary gastrointestinal infection has been clinically observed. Results of experimental infection by the oral route have been equivocal (Barsanti, 1984). The organism is infective primarily for macrophages and stimulates a marked reticulendothelial (RE) response with little associated necrosis (unlike Toxoplasma). This RE response is similar to that seen in visceral leishmaniasis; presence of Barr bodies (kinetoplasts) in the intrahistiocytic amastigotes differentiates it from Histoplasma. African histoplasmosis caused by Histoplasma duboysii is rarely seen outside of that continent and is characterized by having yeasts which are larger than H. capsulatum and which display "hourglass"-like budding.

Contributor. AFAMRL/THP, Bldg. 79, Area B, Wright Patterson AFB, OH 45433.

Suggested reading.

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Case III - 84-4894 (AFIP 1946244).

History. Tissue from a 17-year-old, female, collie, canine dog, which had signs of gastroenteritis for two weeks.

Gross Findings. Dehydration and severe ulcerative colitis. Whipworms were present in the caecum and proximal colon. Many variably-sized nodules were distributed in the myocardium. Similar nodules were also observed in the liver, kidney, and mesentery. Algae were present in the heart, liver, colon, kidney, lung, brain, and mesenteric lymph nodes.

Laboratory Results. Microbiological exam: Prototheca zopfii was isolated from the heart and kidney. Clinical pathologic exam: The CBC was in normal range except for a moderate eosinophilia. Parasitological exam: fecal flotation was positive for whipworm eggs.

Contributor's Diagnosis. Myocarditis, necrotizing, multifocal, severe, heart, collie, canine, etiology - Prototheca sp.

AFIP Diagnosis. Myodegeneration and necrosis, multifocal, moderate, with numerous intralesional algae, myocardium, collie, canine; etiology - Prototheca sp.

Comment. Host inflammatory response was generally absent. Only rarely was a minimal neutrophilic response seen. In many cases of disseminated protothecosis, animals have had preexisting or intercurrent disease which may have increased host susceptibility. Furthermore, it has been conjectured that high serum concentrations of Prototheca-specific immunoglobin may cause a blockade of cell mediated immunity, permitting the entrance and establishment of Prototheca (Cox, 1974). Another possible pathogenetic mechanism has been reported by Venezio and co-workers who observed a deficiency in host neutrophils to destroy Prototheca after phagocytosis. This deficiency appeared specific for Prototheca, as destruction of several species of bacteria was readily accomplished by the neutrophils of the same host. In cutaneous cases of protothecosis in the dog and cat only P. wickerhamii, which is smaller than P. zopfii, has been isolated. In dogs, collies seem to have a greater susceptibility than other breeds (Tyler, 1984).

Contributor. Livestock Disease Diagnostic Center, University of Kentucky, 1429 Newtown Pike, Lexington, Kentucky 40511.

Suggested reading.

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Venezio, F. R.; Lavoo, E.; Williams, J. E. et al.: Progressive protothecosis. Am. J. Clin. Path. 77: 485-493, 1982.

Case IV - LAIR 35638 (AFIP 1945809).

History. Tissue from a young adult, male Megellanic penguin found dead in its pen.

Gross Findings. There was serous atrophy of cardiac fat. Multiple small white foci were randomly distributed throughout the lung parenchyma. Large green powdery fungal colonies were in the thoracic and abdominal air sacs. There was greater involvement of the left side.

Contributor's Diagnosis. Pneumonia, necrotizing granulomatous, multifocal, severe, with vascular invasion of mycotic hyphae and thrombosis, lung, avian. Etiology - Aspergillus sp.

AFIP Diagnoses. 1) Necrogranulomas, heterophilic, multifocal, severe, with diffuse fungal hyphae, diffuse pulmonary congestion, and perivascular and interstitial edema, lung, Megelanic penguin, avian. Etiology - compatible with Aspergillus spp. 2) Vasculitis and thrombosis, segmental, severe, with fungal hyphae, lung.

Comment. In most animals, fungal infections are usually secondary to other preexisting infections. In waterfowl and penguins, however, fungal infections are frequently primary; these birds are extremely susceptible, especially to infection by Aspergillus sp. This could be due to lack of inherent immunity to fungi; the

most susceptible species, sea ducks and Antarctic penguins, are rarely exposed to such fungi in the wild. Another possibility is that these birds are naturally immunosuppressed, a theory supported by the paucity of lymphoid tissue they possess.

Early in Aspergillus infections of birds, there is an accumulation of heterophils in infected parabronchi. Since liquifaction necrosis is poorly accomplished in birds, the herterophil-filled parabronchi are surrounded by granulomatous inflammation in an attempt to wall off the infection. These sites are often resolved as discrete granulomas if the host lives long enough.

Elaboration of elastase by some strains of Aspergillus fumigatus has been correlated with its invasiveness in pulmonary tissues.

Contributor. Letterman Army Institute of Research, SGRD-ULV-P, San Francisco, California 94129.

Suggested reading.

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Results
AFIP Wednesday Slide Conference - No. 3
26 September 1984

Conference Moderator: George D. Imes, Jr.
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Chairman, Department of Veterinary Pathology
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Case I - 82D128 (AFIP 1897187).

History. Tissue from an adult male goat. The goat was euthanatized because it was blind from pink eye and circled constantly.

Gross Pathology. Multiple soft raised areas approximately 1/2 to 1-1/2 cm wide were visible under the pleural surface in the dorsal regions of both lungs. (Gross photos A&B to be forwarded.) No exudate was at the cut surface of the lesions.

Contributor's Diagnosis & Comment. Pulmonary nematodiasis - Muellerius capillaris.

This condition appears to be fairly common in goats and is not usually associated with clinical disease. It has been associated with suppurative bronchopneumonia and may be a significant problem in research goats purchased for cardiovascular studies that require prolonged anesthesia. It can be diagnosed by fecal examination and differentiated from other lungworms of goats by the following criteria:

	D. filaria	M. capillaris	P. rufescens
Adult location	Bronchi	Alveoli	Small bronchioles
Fecal larval length	0.55 - 0.58 mm	0.23 - 0.30 mm	0.25 - 0.33 mm
Other larval characteristics	-	Dorsal spine	No dorsal spine

No middle ear or CNS lesions were found to account for the circling behavior.

AFIP Diagnosis. Pneumonia, interstitial, granulomatous, multifocal, moderate, with associated alveolar, bronchiolar, and bronchial nematode parasites, lung, brown and white, caprine, etiology - compatible with Muellerius sp.

Conference Note. All stages of the parasite are seen in the lung parenchyma; eggs, uninucleate to embryonated, are usually seen in alveoli. Mature larvae are most common in bronchioles; they measure approximately 10 micrometers in diameter and can be seen in some sections to have both an eccentric tail tip, a short dorsal spine, and lateral alae. Adults are most frequently seen in alveoli, occasionally in bronchioles; females are approximately 55 micrometers in diameter and males measure up to 35 micrometers. The differential diagnosis includes Dictyocaulus spp., Muellerius sp., Protostrongylus spp. and Cystocaulus sp. Adults of

Dictyocaulus and Cystocaulus are almost twice as large as the largest adult female seen in this case. Adults of Protostrongylus and Muellerius are of similar size, but larvae of the former lack the dorsal spine of larvae seen in this case. This parasite is morphologically compatible with Muellerius capillaris.

Although many authors write that Muellerius is found primarily in subpleural alveoli, and that this can be used to differentiate it from other metastrongyles, this case demonstrates that it can be found in the airways to the level of bronchioles.

Contributor. Department of Comparative Medicine, Hershey Medical Center, Pennsylvania State University, Hershey, Pennsylvania 17033.

Suggested reading.

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Case II - 84437-6, -7, or -9 (AFIP 1947588).

History. Tissue from a 2-year-old mixed breed steer from a herd known to be persistently infected with bovine viral diarrhea (BVD) virus. The steer had been vaccinated with a modified-live BVD vaccine on 1 Dec 83. There were no clinical signs of BVD after vaccination. The steer was challenged with the cytopathic Tifton strain of BVD virus on 16 Jan 84. In March it developed a chronic progressive wasting syndrome characterized by weight loss, intermittent diarrhea, and dehydration. This steer had severe watery diarrhea and marked anorexia for one week prior to necropsy on 16 Mar 84.

Laboratory Results. Cytopathic BVD virus was isolated from intestine. Blood was collected immediately prior to death . Tests showed: Virus - 10,240 BVD-infectious units/ml serum (cell culture infectious doses). Antibody: BVD neutralization titer: 4 [against noncytopathic BVD virus (Nebraska)]. BVD neutralization titer: 1024 [against cytopathic BVD virus (Singer)].

Gross Pathology. There were erosions and ulcers of the mucosae overlying the intestinal lymphoid tissues. There were ulcers of the abomasum and thickening of the distal ileum, cecum, and proximal colon.

Contributor's Diagnosis & Comment. Severe, multifocal, subacute, fibrinopurulent enteritis with focal necrosis of lymphoid nodules.

This steer and the herd from which it came were persistently infected with a noncytopathic strain of BVD virus. There was no signficant antibody circulating in the steer directed against this persistent noncytopathic strain of virus and no clinical signs had resulted from infection. It is not known whether the animal did not produce antibody or if a small amount of antibody was produced and circulated complexed to BVD virus. When challenged with a virulent, cytopathic BVD virus or vaccinated with a modified, cytopathic BVD virus (we are uncertain which cytopathic virus is involved), the animal developed signs of chronic BVD.

AFIP Diagnoses. 1) Ulceration, focally-extensive, severe, with a fibrinosuppurative pseudomembrane, small intestine, bovine. 2) Enteritis, fibrinosuppurative, subacute, diffuse, moderate to severe, with moderate villous atrophy, blunting and fusion, small intestine, bovine.

Conference Note. Based upon the histologic sections examined, conference attendees could not determine if the mucosal ulceration of the small intestine was located over a necrotic Peyer's patch. Lymphoid necrosis was not obvious, and the abundant lymphocytes present in the submucosa appeared essentially normal. The contributor, however, included focal necrosis of lymphoid nodules in the morphologic diagnosis. Conference attendees thought that the numerous intralesional neutrophils were probably due to secondary bacterial infection. Several studies have identified a small proportion of cattle seronegative to BVD-MD virus in seropositive herds and have further found that mucosal-disease deaths occurred only in these animals, sometimes many months later. It has been suggested that mucosal disease might be the result of immune tolerance established as a result of intrauterine infections. Several studies have supported this but it remains unproven (Roeder, Drew, 1984).

Antigen-localization studies have shown that the major areas of antigen concentration are the same as the areas with the most marked pathomorphological changes - the lymphoid tissues of the distal ileum and proximal colon. Since infections of animals by the alimentary route seems unlikely, it has been suggested that infection is primarily via the respiratory tract, and that dissemination to various tissues is carried out by cells of the mononuclear phagocyte system (Ohmann, 1983).

Contributor. National Animal Disease Center, P.O. Box 70, Ames, Iowa 50010.

Suggested reading.

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Roth, J. A.; Kaeberle, M. L., and Griffith, R. W.: Effects of viral diarrhea virus infection on bovine polymorphonuclear leukocyte infection. Am. J. Vet. Res. 42: 244-250, 1981.

Case III - 84-0363 (AFIP 1947999).

History. Tissue from a 4-year-old female Hampshire sheep. Eight of 30 sheep in the flock became ill about 36 hours after initial access to a new and weedy pasture. Clinical signs included salivation, mydriasis, tremors, ataxia, and paresis. Within four days, 5 of 8 died.

Laboratory Results. Pertinent laboratory data on admission included elevations in BUN (50-80), creatinine (3.6-8.4), and isothenuria.

Gross Pathology. Kidneys bilaterally swollen, pale, moist, fluctuant. Cut edge of kidney moist with radially arranged tannish-white opaque flecks in cortex. Urine transparent, virtually colorless.

Contributor's Diagnosis & Comment. Nephropathy, renal tubular degeneration and necrosis; renal tubular lithiasis (oxalate). Oxalate intoxication due to ingestion of Rumex crispus.

Birefringent crystals of oxalate were present in the rumenal mucosa but were not observed in other loci of the body. Rumex crispus (curly dock) was abundant in the pasture and had been extensively grazed by the sheep. The terminal foliage of the Rumex contained 11% oxalate expressed as oxalic acid.

AFIP Diagnosis. Nephrosis, diffuse, moderate, with moderate diffuse dilation of cortical tubules and Bowman's spaces, intratubular and intraductal birefringent crystals, and medullary eosinophilic casts, Hampshire, ovine, etiology - compatible with oxalate toxicosis.

Conference Note. The most common causes of oxalosis are ingestion of oxalate-containing plants (ruminants) and ethylene glycol. Also, oxalate crystals are often seen in Aspergillus niger infections and may be the source of systemic toxicosis. In the ruminant, ingested oxalates may be degraded to carbonates and bicarbonates, may precipitate as calcium oxalate and remain with the feces, or may be absorbed into the bloodstream and tissues where it binds with ionic calcium to produce insoluble calcium oxalate. The net result is often a precipitous hypocalcemia to which several pathological processes can be attributed: hyperglycemia may be attributable to the effect of low serum calcium on insulin secretion; inhibition of succinate dehydrogenase may be a significant factor in death (Simensen, 1980); and there may be interference with the essential roles of calcium and magnesium in oxidative phosphorylation at the cellular level (Van Kampen, James, 1969). A second problem is that of crystallization of calcium oxalates in vessel walls causing vascular necrosis and hemorrhage, and in renal

tubules and ducts causing blockage and necrosis. An interesting study by Van Kampen and James showed crystal deposition at different levels of the renal collecting ducts and tubules at different time intervals after ingestion of Halogeton by sheep.

Contributor. College of Veterinary Medicine, Oklahoma State University, Stillwater, Oklahoma 74078.

Suggested reading.

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Case IV - 7042-3 (AFIP 1945250).

History. Tissue from a male bovine fetus aborted approximately 6 weeks prematurely. The dam appeared normal prior to abortion and had no clinical evidence of disease after expulsion of the fetus.

Gross Pathology. The fetus had massive ascites and hemoperitoneum. Numerous discrete whitish nodules measuring from several millimeters to centimeters in diameter were attached to the parietal and visceral peritoneum. Other gross changes were not observed.

Contributor's Diagnosis & Comment. Mesothelioma, congenital, bovine.

Mesothelioma is the most commonly diagnosed congenital tumor in calves. The greatest incidence is observed in fetal and neonatal calves but reports of mesothelioma in older cattle have been documented. Peritoneal mesotheliomas may take either of two histological forms, predominantly fibrous resembling a fibrosarcoma or papillary mimicking a papillary adenocarcinoma.

AFIP Diagnosis. Mesothelioma, abdominal peritoneum, Holstein fetus, bovine.

Conference Note. Mesothelial cells are similar in structure and function to epithelial and endothelial cells but are of mesodermal origin. Major diagnostic problems can arise when mesotheliomas must be differentiated from epithelial neoplasms. Ultrastructurally, mesotheliomas possess microvilli and desmosomes characteristic of epithelial cells. Using immunocytochemical techniques, Warhol has recently shown that cells of human mesotheliomas also contain abundant keratin, and that they irregularly express carcinoembryonic antigen (CEA), markers heretofore thought unique to epithelial cells.

In differentiating mesotheliomas from carcinomas by light microscopy, several special staining characteristics have been suggested by the Departments of Chemical Pathology and Pulmonary and Mediastinal Pathology, AFIP.

Carcinoma	Mesothelioma
1) PAS positive-diastase sensitive due to the presence of glycogen.	1) PAS positive-diastase sensitive due to the presence of glycogen.
2) PAS positive-diastase resistant due to production of epithelial mucin.	2) (does not produce epithelial mucin).

Therefore, the presence of PAS positive-diastase resistant material should rule out the diagnosis of mesothelioma.

3) Colloidal iron (AMP) positive due to production of mucopolysaccharides.	3) Colloidal iron (AMP) positive due to production of mucopoly-saccharides.
4) Hyaluronidase resistant - mucopoly-saccharide is not hyaluronic acid.	4) Hyaluronidase sensitive - hyaluronic acid acid.
5) Alcian-blue positive material should be seen.	5) Alcian-blue positive material should be seen.
6) Cells more pleomorphic.	6) Cells less pleomorphic.
7) Nuclei more irregular.	7) Nuclei more regular.
8) More likely to form acinar structures.	8) Less likely to form acinar structures.

Stains Required
1. PAS with and without diastase.
2. AMP with and without hyaluronidase.
3. Alcian blue.

The guidelines may be helpful but results must be interpreted with great care due to the many variables involved in special staining techniques. The above stains were used on this WSC case, but the results were equivocal.

Contributor. Veterinary Diagnostic Center, University of Nebraska, Lincoln, Nebraska 68583.

Suggested reading.

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Results
AFIP Wednesday Slide Conference - No. 4
3 October 1984

Conference Moderator: John M. Langloss, DVM, PhD
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Washington, DC 20306

Case I - A25704 (AFIP 1905203).

History. Tissue from an 8-year-old male castrated cocker spaniel. The dog had a proliferative mass in the right ear canal with purulent exudate. The mass was removed in May 1981 with regrowth removed in Dec 1981. The dog presented in May 1982 with tetraparesis. Radiographs revealed osteolytic lesion of C5. Cervical myelogram indicated space-occupying mass in the lateral spinal canal at C5. The dog was euthanatized at owner request.

Gross Pathology. The right venous sinus at the C5 is dilated and filled with grayish tissue, projecting into the spinal canal and compressing the cord.

Laboratory Results. Results of all serum chemistry, hematologic and urinary analyses were within normal limits.

Contributor's Diagnosis & Comment. Metastatic chemodectoma to the fifth cervical vertebrae.

Chemodectoma was diagnosed in the first and second biopsy surgical removal, based on the round ovoid epithelial-like neoplastic cells arranged in nests or clusters, associated or separated by delicate fibers or blood spaces. This tumor originating from the ear canal is unusual, inasmuch as chemodectomas have been found in the carotid, aortic and pulmonary bodies and occasionally in the urinary bladder.

AFIP Diagnosis. Malignant neoplasm, vertebral body, cocker spaniel, canine.

Conference Note. The attendees' differential diagnosis included mast cell tumor, APUD tumor (chemodectoma), and plasma cell tumor (myeloma). In some sections, the morphology of the tumor cells resembles that of mast cells; however, numerous special stains failed to yield conclusive results.

Some conference attendees thought that the tumor cells were packeted by fine fibrovascular septa, while others thought this septal network was probably the sinusoidal septa normally found in the medullary cavity. A Churukian and Schenk silver stain failed to demonstrate argyrophilic granules in the cells. The Department of Endocrine Pathology, AFIP, thought this neoplasm is of neuroendocrine origin.

Most conference attendees thought that, based on the morphology of the neoplastic cells and the radiolucencies in the affected cervical veterbrae, a diagnosis of myeloma could be made. However, most neoplastic cells lack eccentric nuclei, a perinuclear Golgi halo, and heterochromatin patterns typical of plasma cells. Methyl-green-pyronin staining is often helpful in demonstrating RNA in the copious rER of plasma cells. Best results in bone sections would be obtained using EDTA as the decalcifying agent.

Contributor. The Animal Medical Center, 510 East 62 Street, New York, New York 10021.

Suggested reading.

Patnaik, A. K.; Liu, S. K; Hurvitz, A. I. et al.: Canine chemodectoma (extra-adrenal paragangliomas) -- a comparative study. J. Sm. Anim. Pract. 16: 785-801, 1975.

Patnaik, A. K.; Lord, P. F., and Liu, S. K.: Chemodectoma of the urinary bladder in a dog. J. Am. Vet. Med. Assoc. 164: 797-800, 1974.

Patnaik, A. K. et al.: Extracutaneous mast cell tumor in the dog. Vet. Path. 19: 608-615, 1982.

Case II - 00784 (AFIP 1946890).

History. Tissue from a 30-pound 9-year-old male springer spaniel canine. This dog was presented with a 2-year history of chronic pyoderma. The referring veterinarian had observed polyuria and polydipsia in addition to severe pyoderma, alopecia, and rapid weight loss. The dog was treated with antibiotics but developed a respiratory infection and was euthanatized at the owner's request.

Gross Pathology. The dog had bilateral alopecia, calcinosis cutis and an ulcerative pyoderma of the face, legs and lateral thorax. The lung lobes were firm, red-brown and contained multiple dark red-grey foci filled with purulent material. The conducting airways were filled with purulent exudate. A large, dark brown, irregular mass was present in the area of the pituitary (10x8x7 mm) and compressed the hypothalamus. The adrenal glands were bilaterally enlarged with thickened, nodular cortical tissue. The parathyroid glands were moderately enlarged.

Laboratory Results. At presentation, the referring veterinarian observed that this dog had a mature leukocytosis, elevated serum alkaline phosphatase, alanine aminotransferase, and cholesterol, but a near normal BUN and creatinine. Its urine specific gravity was very low (1.005), did not respond to water deprivation, but did increase to 1.016 with the vasopressin test (pitressin). The owners refused further tests or treatment when the respiratory infection developed shortly thereafter.

Contributor's Diagnosis & Comment. Chromophobe adenoma in the pars distalis, with necrosis, cyst formation and compression of the neurohypophysis and hypothalamus, pituitary, dog.

In addition to the pituitary tumor this dog had bilateral cortical hyperplasia of its adrenal glands, an ulcerative dermatitis with epidermal atrophy and dermal mineralization, mild parathyroid gland hyperplasia, marked lymphoid depletion of its spleen and lymph nodes, and a severe, chronic active, suppurative bronchopneumonia with abscessation and interstitial fibrosis. This dog probably had an endocrinologically active corticotroph (ACTH-secreting) adenoma of the adenohypophysis that resulted in an almost classical presentation of pituitary dependent hyperadrenocorticism (canine Cushing's syndrome). Regretfully, pituitary-adrenocortical function tests were not performed; however, the morphological lesions observed at necropsy are typical for this syndrome. This dog's clinical signs of diabetes insipidus were likely the result of the tumor destroying the normal adenohypophysis, neurohypophysis and hypothalamus (Capen, C.C., 1978 and 1983). This syndrome of long term cortisol excess is often complicated by severe bacterial infections. This was seen in this case, with a severe suppurative bronchopneumonia the final outcome.

AFIP Diagnosis. Chromophobe adenoma, pituitary gland, Springer spaniel, canine.

Conference Note. Immunohistochemical stains revealed that the tumor cells were producing ACTH and that the remnants of normal adenohypophysis situated around the edge of the mass were producing prolactin. Similar staining procedures to detect the pituitary glycoprotein hormones (TSH, FSH, LH) are often unrewarding; these hormones share a common beta chain which frequently leads to cross reactivity.

Contributor. Department of Pathology, University of Maryland School of Medical, Baltimore, Maryland.

Suggested reading.

Capen, C. C.: Tumors of the endocrine glands. Chapt. 12, In Tumors in Domestic Animals, Moulton, J. E. (ed.), 2nd Ed., Revised, University of California Press, Berkeley, 1978, pp. 372-429.

Capen, C. C.: The pituitary, overview. In Pathology of Laboratory Animals - Endocrine System. Jones, T. C., Mohr, U., Hunt, R. D., (eds.), International Life Sciences Institute, Springer-Verlag, New York, 1983, pp. 99-120.

Chalifoux, L. V.; Mackey, J. J., and King, N. W.: A sparsely granulated, nonsecreting adenoma of the pars intermedia associated with galactorrhea in a male rhesus monkey (Macaca mulatta). Vet. Path. 20: 541-547, 1983.

Charpin, C.; Hassoun, J. et al.: Immunohistochemical and immunoelectron-microscopic study of pituitary adenomas associated with Cushing's disease. Am. J. Path. 109: 1-7, 1982.

DeStephano, D. B.; Lloyd, R. V.; Pike, A. M. et al.: Pituitary adenoma - an immunohistochemical study of hormone production and chromogranin localization. Am. J. Path. 116: 464-472, 1984.

Dunbar, M. Jr., and Ward, B. C.: Hyperadenocorticism associated with diabetes incipidus and hypothyroidism in a dog. J. Am. Anim. Hosp. Assoc. 18: 737-741, 1982.

Peterson, M. E.: Hyperadrenocorticism. Small Anim. Pract. 14(3): 731-749, 1984.

Tsuchitani, M., and Narama, I.: Pituitary thyrotroph cell adenoma in a Cynomolgus monkey (Macaca fascicularis). Vet. Path. 21: 444-447, 1984.

Case III - 83-2189 I, 83-2189 II (AFIP 1947253). (EM slide included).

History. Tissue from a 3-week-old male Persian kitten. Three of five littermates in a purebred cattery died within 24 hours after exhibiting mouth breathing and lethargy, i.e. signs of a "cold". Two kittens were submitted for necropsy. A foster kitten (1 week older) had been introduced into the litter one week previously. It died 4 days after the first 3 animals died.

Gross Pathology. Both kittens were fat and hydrated. One kitten had numerous oral punctate 2x2 mm ulcers on the tongue. Both had large confluent areas of consolidation and pneumonia in the lung.

Contributor's Diagnosis & Comment.
Etiology: Feline herpes virus.
Pneumonia, necrotic and proliferative, subacute, multifocal, severe, lung. Necrosis, acute, multifocal, moderate, liver with numerous Cowdry Type A intranuclear inclusions in hepatocytes.

The initial presentation of this case corresponds with the respiratory feline viral rhinotracheitis syndrome. However, due to the age and relatively immature immunological status of these kittens, they rapidly developed a fulminating systemic disease with characteristic multifocal areas of parenchymal cell necrosis in several visceral organs. The electron micrographs demonstrate numerous particles within the nucleus, budding through the cytoplasm of a hepatocyte and free within the space of Disse. The nuclear particles have an average diameter of 106 nm consisting of a central dense core surrounded by a clear zone bounded by an outer membrane. Cytoplasmic particles have an average diameter of 163 nm and are bounded by an additional clear zone surrounded by another membrane.

AFIP Diagnoses. 1) Pleuropneumonia, fibrinous, necrotizing, subacute, diffuse, severe, with multifocal moderate arteritis and eosinophilic intranuclear inclusion bodies, lung, Persian, feline. 2) Necrosis, hepatocellular, multifocal, mild to moderate, with eosinophilic intranuclear inclusion bodies, liver, etiology - compatible with feline herpesvirus.

Conference Note. Conference attendees discussed feline calicivirus (FCV) as a differential diagnosis. Lung lesions of FCV would be more patchy, more cellular, and frequently have hyperplasia and hypertrophy of Type II pneumocytes. Vascular lesions are not typically seen, nor is overt systemic disease. Due to the finding of lingual ulcers at necropsy, the possibility of a dual (FCV and Herpes) infection was discussed, although oral ulcers are occasionally seen with herpesvirus infections alone.

Herpesviruses are highly cell-associated; they can mature intracellularly and spread contiguously from cell to cell avoiding exposure to circulating antibodies. These characteristics are responsible for the poor immunity which follows exposure to this agent. Local production of IgA is thought to be of importance, and new evidence suggests an active role for cell-mediated immunity. Isolation of the virus from the trigeminal ganglia of cats suggests there may be persistence of the virus in a latent form similar to that seen in bovines and humans (Nasisse, 1982).

Contributor. Comparative Pathology Branch, US Army Research Institute of Chemical Disease, Aberdeen Proving Ground, Maryland 21010.

Suggested reading.

Arnett, B. D., and Greene, C. E.: Feline respiratory diseases. In Microbiology and Infectious Diseases of the Dog and Cat. Chapt. 30, C.E. Greene, Editor, Saunders, 1984, p. 527.

Gaskell, R. M., and Povey, R. C.: Transmission of feline viral rhinotracheitis. Vet. Rec. 111: 359-362, 1982.

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Case IV - V82-487 (AFIP 1897382).

History. Tissue from an 11-year-old male terrier cross dog. Sudden onset of a mass in the ventral neck region was seen 3-4 months prior to presentation. An aspirate of the mass produced a large volume of serosanguinous fluid. The mass was removed surgically but recurred 2 months after surgery, at which time the dog was euthanatized.

Gross Pathology. At necropsy the neoplasm was found to have metastasized to regional lymph nodes, but distant metastases were not noted.

Contributor's Diagnosis & Comment. Malignant mixed thyroid tumor.

Malignant mixed thyroid tumors are more common in dogs than in humans (where they are considered to be rare). Some authors make a distinction between the terms malignant mixed tumor (where the epithelial and mesenchymal elements are separate) and carcinosarcoma (where these two components are more closely intermixed). In this particular case, the glandular and mesenchymal components seemed, for the most part, to reside in separate regions of the tumor. Although not present within every section, both osteoid and cartilage were found within the sarcomatous regions.

AFIP Diagnosis. Malignant mixed neoplasm, thyroid, with metastases to lymph node and lung, terrier cross, canine.

Conference Note. There is variation in the tissues present; some microslides include sections of lymph node and/or lung, and in some there are remnants of normal thyroid along the margins of the tumor. The amount of osseous and cartilagenous differentiation also varies, but squamous differentiation is consistent in most sections. Some attendees noted what appeared to be empty abortive follicles within the epithelial areas of the neoplasms. Immunohistochemical stains for thyroglobulin and calcitonin were negative. A recent study by Moore et al., suggests that only carcinomas with follicular patterns show any consistency in immunopositivity for thyroglobulin.

Most carcinomas metastasize via lymphatics and are usually first detected in draining lymph nodes. Thyroid carcinomas are locally invasive; early invasion of cranial and caudal thyroid veins will result in multiple pulmonary metastases

before involvement of local lymph nodes is seen. Mixed neoplasms are more commonly seen in the mammary and salivary glands.

Contributor. Bushy Run Research Center, R.D. 4, Mellon Road, Export, Pennsylvania 15632. (Submitted for the FDA).

Suggested reading.

Brodey, R. S., and Kelly, D. F.: Thyroid neoplasms in the dog - a clinicopathologic study of fifty-seven cases. Cancer 22: 406-416, 1968.

Buergelt, C. D.: Mixed thyroid tumors in two dogs. J. Am. Vet. Med. Assoc. 152: 1658-1663, 1968.

Johnson, J. A., and Patterson, J. M.: Multifocal myxedema and mixed thyroid neoplasm in a dog. Vet. Path. 18: 13-20, 1981.

Leav, I.; Schiller, A. L.; Rijnberk, A. et al.: Adenomas and carcinomas of the canine and feline thyroid. Am. J. Path. 83: 61-93, 1976.

Mason, R., and Wells, H. G.: On the occurrence of true mixed carcinomatous and sarcomatous tumors (sarcocarcinoma) with report of a mixed carcinoma-chondrosarcoma of the thyroid of a dog. J. Canc. Res. 13: 207-217, 1929.

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Results
AFIP Wednesday Slide Conference - No. 5
10 October 1984

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Case I - MK 84-848 (AFIP 1947596).

History. Tissue from an incidental finding at necropsy of an aged female rhesus monkey.

Gross Pathology. Present adjacent to the right ovary was a 2.5 cm diameter multilobulated white mass.

Contributor's Diagnosis & Comment. Endometriosis, periovarian, rhesus monkey, Macaca mulatta.

Endometriosis is a common occurrence in rhesus monkeys; it occurs spontaneously but has also been associated with surgical manipulation of the uterus (hysterotomy) and exposure to ionizing radiation. Clinically, monkeys exhibit dysmenorrhea, menorrhagia, irregular menstrual cycles and infertility. The endometrial tissues which are within the abdominal cavity are responsive to hormones and can enlarge, form cysts filled with brown to red fluid, and rupture during menstruation, producing extensive adhesions. Complications such as colonic and ureteral stricture, intra-abdominal hemorrhage and anemia can result.

The cause of endometriosis is not known. There may be regurgitation of endometrium through the infundibulum of the oviduct into the peritoneal cavity during menstruation; endometrium may be seeded into the peritoneal cavity during uterine surgery; there may be metaplasia of coelomic epithelium into endometrial tissue; cell rests of the Wolffian duct system may undergo transformation to endometrial tissue, or there may be lymphatic or hematogenous metastasis of endometrial tissue.

AFIP Diagnosis. Endometriosis, periovarian (per contributor), rhesus monkey, (Macaca mulatta), primate.

Conference Note. The site of the lesion in this case cannot be determined from the histologic sections provided. Even though the stroma in endometriosis is characteristically uterine in appearance, endometriosis generally can be differentiated from uterine adenomyosis because the former lacks myometrial layers with interposed vasculature. A uterine neoplasm usually can be ruled out because it generally would not be as well-differentiated as this lesion, would often contain more glandular structures and there would be no endometrial stromal proliferation. Cells resembling eosinophils are scattered throughout the stroma. These are endometrial granulocytes which are derived from stromal cells; at menstruation they congregate subjacent to the endometrium and secrete relaxin which causes dissolution of the stroma. They are seen in primates and rats.

Endometriosis is a condition seen only in primates and the epithelium is responsive to estrogen and progesterone. This condition has been reproduced by seeding of the abdomen with minced endometrial tissue followed by treatment with ovarian steroids (Bertens et al., 1982). Adenomyosis is seen in primates as well as other mammals and is generally not responsive to ovarian steroids.

Contributor. Comparative Pathology Section, National Institutes of Health, 9000 Rockville Pike, Bethesda, Maryland 20205.

Suggested reading.

Bertens, A.P.M.G. et al.: Endometriosis in rhesus monkeys. Lab. Anim. 16: 281-284, 1982.

DiGiacomo, R. F.: Gynecologic pathology in the rhesus monkey (Macaca mulatta). II. Findings in laboratory and free-ranging monkeys. Vet. Path. 14: 539-546, 1977.

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MacKenzie, W. F., and Casey, H. W.: Animal model: Endometriosis in rhesus monkeys. Am. J. Path. 80: 341-344, 1975.

McClure, H. M.: Endometriosis. In Spontaneous Animal Models of Human Disease. Vol. 1, Andrews, E. J., Ward, B. C. and Altman, N. H. (Eds.), Academic Press, New York, 1979, pp. 215-218.

Case II - BGSM 8171 (AFIP 1947391).

History. Tissue from a 16-month-old, male, African green monkey (Cercopithecus aethiops) which was found semicomatose, with a temperature of 94°F. Petechial hemorrhages appeared on the ventral abdomen, and spread to the axillary region and arms within minutes. He died shortly thereafter.

Gross Pathology. The large intestine was externally dark red; it contained dark red, foul-smelling fluid. The mucosa had scattered round, raised white nodules up to 3 mm in diameter, which were most numerous in mid-colon. Mesenteric lymph nodes were enlarged and hemorrhagic. The liver was enlarged and friable.

Laboratory Results.

Bacterial isolates at necropsy:

Lung, spleen, liver, kidney: Yersinia enterocolitica

Gut: E. coli, Campylobacter fetus, ssp. jejuni

Contributor's Diagnoses & Comment. 1) Colitis, acute, necrotizing, multifocal, severe, African green monkey, etiology - Yersinia enterocolitica. 2) Hepatitis, acute, necrotizing, multifocal, African green monkey, etiology - Yersinia enterocolitica.

Multifocal necrotizing lesions containing bacterial colonies were also found in spleen and kidney from this case. The bacteria were gram-negative.

Yersiniosis is a well-documented disease in nonhuman primates. In our colony it occurs in young animals with access to outdoors, in sporadic outbreaks. All cases prior to this in our colony had been due to Y. pseudotuberculosis. This case was also unusual for the severity of the lesions, in our experience. The necrotic foci in the colon mucosa usually are more superficial, but in this case some lesions are transmural, apparently due to infarction. The short clinical course and the presence of bacterial colonies in necrotizing lesions, however, are typical.

AFIP Diagnoses. 1) Colitis, necrotizing, acute, multifocal, moderate to severe, with numerous bacillary colonies and submucosal phlebitis and phlebothrombosis, large intestine, African green monkey (Cercopithecus aethiops), primate. 2) Serositis, acute, focally extensive, mild, with phlebitis, thrombosis, and numerous bacillary colonies, mesenteric attachment of large intestine, etiology - compatible with Yersinia spp. 3) Hepatitis, necrotizing, acute, multifocal, mild, with nmumerous coccobacillary colonies, liver.

Conference Note. Conference attendees noted areas of apparent infarction in the colon as mentioned by the contributor. Also, several attendees saw intralesional ameboid organisms, and spirochetes within colonic crypts in areas unaffected by the inflammatory process.

A hallmark of Yersinia enterocolitica infections is that the lesion(s) are usually of mild severity, making this case unusual as noted by the contributor. The pathogenesis and epidemiology are not well known because infections are difficult to reproduce experimentally. Swine and dogs have been incriminated as potential reservoirs of Y. enterocolitica; in contrast, human infection by Y. pseudotuberculosis is associated with contaminated food. Interestingly, the peak antibody titer to Y. enterocolitica is during convalescence rather than during the acute phase of the disease (Baskin, 1980). The aforementioned criteria help to differentiate disease caused by Y. enterocolitica from an otherwise similar disease caused by Y. pseudotuberculosis.

The most severe form of Y. pseudotuberculosis infection is seen in nonhuman primates, artiodactyls, and edentates, and is characterized by acute, severe fibrinonecrotic enteritis and mesenteric lymphadenitis with disseminated necrotic foci in the liver, lung and spleen. A less acute form is seen in birds and some mammals in which there is development of disseminated pyogranulomatous nodules throughout the viscera, except for the intestines where lesions are absent or similar to the acute form but less severe. A chronic form is seen in rodents, especially rats, and is characterized by the presence of occasional granulomatous nodules in lymph nodes, liver and spleen (Baskin, 1980).

Since most strains of Y. pseudotuberculosis do not produce exotoxins, the tissue necrosis produced during infections is thought to be due to an endotoxin which may also be coupled with the effects of lysosomal proteolytic enzymes of dying leukocytes (Obwolo, 1980).

Contributor. Department of Comparative Medicine, Bowman Gray School of Medicine, 300 South Hawthorne Road, Winston-Salem, North Carolina 27103.

Suggested reading.

Baskin, G. B.: Comparative aspects of Yersinia pseudotuberculosis infection in animals. In The Comparative Pathology of Zoo Animals, Montali, R. J. and Migaki, G., (Eds.), Smithsonian Institution Press, 1980, p. 219.

Bronson, R. T.; May, B. D., and Ruebner, B. H.: An outbreak of infection by Yersinia pseudotuberculosis in nonhuman primates. Amer. J. Path. 69: 289-303, 1972.

Carter, P. B.: Animal Model: Oral Yersinia enterocolitica infection in mice. Am. J. Path. 81: 703-706, 1975.

McLure, H. M.; Weaver, R. E., and Kaufman, A. F.: Pseudotuberculosis in nonhuman primates: Infection with organisms of the Yersinia enterocolitica group. Lab. Anim. Sci. 21: 376-382, 1971.

Obwolo, M. J.: The pathogenesis of yersiniosis. In The Comparative Pathology of Zoo Animals, Montali, R. J. and Migaki, G., Editors, Smithsonian Institution Press, 1980, p. 225.

Wooley, R. E.; Shotts, E. B., and McConnell, T. W.: Isolation of Yersinia enterocolitica from selected animal species. Am. J. Vet. Res. 41: 1667-1668, 1980.

Case III - N83-319 (AFIP 1900652).

History. Tissue from a 12-year-old, female, spotted jaguar (Panthera onca) which had a history of chronic Ovaban usage for 6 years. Prior to euthanasia it developed abdominal distension and obstipation. A peritoneal tap revealed a nonseptic exudate with characteristics of neoplasia. Abdominal radiographs were followed by an exploratory laparotomy which revealed carcinomatosis involving the mesentery and omentum.

Gross Pathology. Disseminated neoplasia, multifocal, severe, uterus, ovaries, omentum, mesentery, iliac lymph nodes and splenic capsule.

Contributor's Diagnoses & Comment. 1) Uterine adenocarcinoma, with metastasis to ovaries, omentum, mesentery, iliac lymph nodes, splenic capsule and broad ligament. 2) Cystic distension of endometrial glands, severe, with multifocal mineralization, uterus.

The uterine adenocarcinoma probably originated at multiple sites within the endometrium, most likely from endometrial glands. Metastasis occurred via lymphatics and transperitoneal seeding. Whether it was related to Ovaban usage remains unclear; so does the relationship between the endometrial gland changes and Ovaban.

AFIP Diagnoses. 1) Adenocarcinoma, papillary, uterus, spotted jaguar (Panthera onca), feline. 2) Hyperplasia, cystic, endometrial glands, diffuse, severe, with multifocal mineralization, uterus.

Conference Note. Conference attendees discussed the possible relationship between chronic megestrol acetate (Ovaban) usage and the lesions seen in this case. Studies have shown that endometrial atrophy is the end result of chronic use of progestin preperations upon an endometrium which has not been "primed" by estrogens. However, in women it is thought that the pathogenesis of endometrial carcinoma begins with cystic endometrial hyperplasia due to overstimulation by estrogens. A progressive, step-wise change of the uterus leads toward cell transformation, carcinoma-in-situ, and eventually invasive adenocarcinoma (Preiser, 1964).

Uterine neoplasms are rare in domestic cats and are most commonly seen in the rabbit and bovine. Adenocarcinoma in the cow is characteristically scirrhous, often with small foci of tumor evoking a florid desmoplasia. In the doe, a higher incidence of uterine adenocarcinoma is seen in breeds which have a concomittant susceptibility to toxemia of pregnancy. It has been suggested that liver damage resulting from the toxemia could result in failure to inactivate estrogen with eventual development of adenocarcinoma of the uterus (Cotchin, Marchant, 1977).

Contributor. Department of Comparative & Experimental Pathology, College of Veterinary Medicine, University of Florida, Gainesville, Florida 32610.

Suggested reading.
Baba, N. and von Haam, E.: Animal model: Spontaneous adenocarcinoma in aged rabbits. Am. J. Path. 68: 653-656, 1972.
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O'Rourke, M. D. and Geib, L. W.: Endometrial adenocarcinoma in a cat. Cornell Vet. 60: 598-604, 1970.
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Case IV - 820698X (AFIP 1852297).

History. Incidental necropsy finding in an adult, wild-captured, female Cebus monkey. A group of 15 wild-caught sub-adult and adult Cebus monkeys were held in quarantine for 4 weeks. The animals were experimentally inoculated with various strains of an American hemorrhagic fever virus in attempts to find an animal model of the human disease. The animal failed to develop clinical illness and histologic evidence of virus infection.

Gross Pathology. At necropsy a well-differentiated cholangiocarcinoma in the liver was observed, as well as numerous 0.5 to 2.5 cm diameter greyish-tan nodules on the serosal surface of the duodenum and jejunum.

Laboratory Results. Virus could not be isolated from samples of brain, liver, spleen, lung, lymph node and kidney at 30 days post-inoculation. Intestinal nodules from this Cebus monkey (AFIP 1852297-9) and 2 other animals in this group (AFIP 1852847-1 and 1851691-4) were examined by a parasitologist and were identified as Molineus sp. probably M. torulosus.

Contributor's Diagnosis & Comment. Pyogranuloma, verminous, nodular, focal, mild to moderate, jejunum, Cebus sp.
Etiologic diagnosis: Nodular verminous (molineus) pyogranuloma.
Etiology: Molineus sp., probably Molineus torulosus.
In this group of 15 capuchin monkeys, Molineus nodules were observed in the small intestine, colon, liver, pancreas and/or omentum of 11 animals (73%). An additional 2 animals had fibrosiderotic plaques on the serosa of the small intestine which may have been remnants of parasitic nodules or migration tracts. Nine of the 11 infected animals had nodules in the jejunum; pyogranulomata were also observed in the duodenum (n=5), ileum (n=3), proximal colon (n=2), pancreas (n=2), liver (n=1) and omentum (n=1). One Cebus monkey died of diffuse severe chronic fibrinopurulent peritonitis which was attributed to infection by this parasite.

The adult helminths in the nodules are readily identified as trichostrongylins based on 1) conspicuous longitudinal ridges projecting from the cuticle, 2) platymyarian meromyarian musculature which can be transitional, 3) strongylin intestine which is prominent having a large lumen, large intestinal cell nuclei, multinucleate intestinal cells, and thin to intermediate microvillous border, 4) and thin-shelled non-larvated, morula-stage eggs.

The life cycle of Molineus sp. is unknown, but because the organism is a trichostrongyle, it is assumed to be direct. It is assumed that all animals were infected in the wild. Many of the animals in this group also had malaria and

patent filarid infections (microfilaremia). Differential diagnosis at autopsy should include Oesophogastomum, however, this helminth is considered very rare in New World monkeys; it causes nodules predominantly in the colon of Old World monkeys and apes. Histologically, Oesophogastomum can immediately be ruled out as a cause of the nodules, because there are multiple adult worms with their eggs in the lesion.

Histologically, the nodule is a typical granuloma with a suppurative core. In some sections the core of the nodule clearly communicates with the lumen of the small intestine. The non-larvated eggs are released into the intestinal lumen and infrequently the adult worms project into the lumen. Several species of Molineus are recognized, but only M. torulosus has been recognized as causing nodular granulomata; the other species of Molineus typically lie unattached on the intestinal mucosa.

AFIP Diagnosis. Granuloma, eosinophilic, focal, containing numerous adult nematodes and eggs, serosa, small intestine, Cebus monkey, primate; etiology - compatible with Molineus torulosus.

Conference Note. Other than Oesophogostomum, parasites which must be differentited from Molineus include Nochtia and Prosthenorchis. Like Molineus, Nochtia is a trichostrongylid but produces papillomatous mucosal nodules in the stomach of Old World monkeys. In the adult worm, external to the lateral cords, the cuticular ridges are fused and divergent from one another; this morphologic characteristic is unique to Nochtia. Prosthenorchis is an acanthocephalan which produces serosal nodules in the large intestine and occasionally the ileum of New World monkeys; thorny-headed worms will be seen attached to the mucosal surface.

M. torulosus differs from other trichostrongylids in the propensity of infective larvae to burrow much deeper into the intestine, often reaching the submucosa or occasionally even the serosa as in this case. Larvae mature into adults and their eggs are deposited in the tissues; some make their way to the lumen via necrotic channels. M. torulosus also has a tendency to invade the host's vascular system; adults and eggs are often seen in vessels associated with fibrinous thrombi. Another characteristic is invasion of the pancreas resulting in chronic pancreatitis with adults and eggs often evident within inflamed pancreatic ducts (Brack et al., 1973).

Contributor. Division of Pathology, U.S. Army Medical Research Institute for Infectious Disease, Fort Detrick, Maryland 21701.

Suggested reading.

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Results
AFIP Wednesday Slide Conference - No. 6
17 October 1984

Conference Moderator: F. M. Garner, D.V.M.
Diplomate, ACVP
Veterinary Pathologist
4416 Oak Hill Road
Rockville, MD 20853

Case I - X13790 (AFIP 1803451).

History. Tissue from a 6-month-old female Fischer 344 rat.

Gross Pathology. The rat was found at necropsy to have a left kidney four times the normal size. The mass was infiltrated with pale friable tissue. There was no evidence of metastasis.

Contributor's Diagnosis & Comment. Embryonal nephroma (nephroblastoma). Primary tumors of the urinary tract are uncommon in the rat (Baker, Lindsey, 1979). Nephroblastomas (embryonal nephroma, Wilms' tumor) are reported to be the most frequent type of renal tumor in the rat (Hottendorf, Ingraham, 1968). Nephroblastomas occur in younger animals (mean age less than one year).

AFIP Diagnosis. Nephroblastoma, kidney, Fischer 344, rat, rodent.

Conference Note. The Department of Urogenital Pathology provided the opinion that this rat's neoplasm is similar histomorphologically to some cases of Wilms' tumor in children. A difference they note is in the cells which have undergone epithelial differentiation from the blastema. In this case, many cells have small nuclei with uniform chromatin stippling and appear benign in comparison to the cells in tumors of children which have large and vesicular nuclei, imparting a more malignant appearance. This case is similar to those tumors in children which have a predominantly epithelial element forming small cysts (some of which represent abortive glomeruli). More commonly, they see tumors with a prominent mesenchymal element, and occasionally tumors that are purely mesenchymal.

Hard and Grasso (1976) suggest that the rat nephroblastoma is the counterpart of the epithelial component of human Wilms' tumor, whereas the rat mesenchymal tumor seems to correspond to the mesenchymal component of the same human tumor. Because of the histologic spectrum in the human tumor, and the occurrence in the rat of the epithelial (nephroblastoma) and mesenchymal tumors as separate entities, the concept that Wilms' tumor of man may often represent a composition tumor (composed of two or more malignant cell populations) should be considered.

A similar tumor in rabbits serves as a model for this neoplasm in humans. Similarities are seen in histiogenesis, size of the primary tumor, and malignant character in both rabbits and humans. Polycythemia is seen commonly in the rabbit, and occasionally in humans, in conjunction with nephroblastomas. This is possibly

due to excessive erythropoeitin production by the tumor or by remaining normal renal tissue, in response to renal hypoxia from tumor impingement upon the blood supply.

Contributor. Pathology Department, Eli Lilly & Company, P.O. Box 708, Greenfield, Indiana 46140.

Suggested reading.

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Hard, G. C., and Fox, R. R.: Histologic characterization of renal tumors (nephroblastomas) induced transplacentally in IIIVO/J and WH/J rabbits by N-ethylnitrosourea. Am. J. Path. 113: 8-18, 1983.

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Wardrop, K. J., Nakamura, T., and Gliddens, W. E.: Nephroblastoma with secondary polycythemia in a New Zealand white rabbit. Lab. Anim. Sci. 32: 280-282, 1982.

Case II - 84P-140 (AFIP 1946537).

History. Tissue from a 4-year-old Yellow Nape Amazon parrot. The bird was acquired from a pet store 10 days earlier. It became progressively more docile, passive, and depressed. Loose green droppings were noted; it regurgitated prior to death.

Gross Pathology. Petechiae seen on epicardium. Edema found in lung. Multiple yellow foci in liver. Lemon yellow exudate noted in mesentery (spleen was not swollen but was showing evidence of postmortem change). Kidney was swollen and pale olive color.

Laboratory Results. Microscopic: Tapeworm ova seen in fecal. Culture: Negative for Salmonella and other bacterial pathogens. Also negative for Candida. Virology: Negative for avian influenza, Newcastle, and Pacheco's. Chlamydia psittaci was isolated.

Contributor's Diagnosis. Focal necrotic hepatitis, acute psittacosis.

Liver - severe multiple variable size foci of coagulation necrosis was seen throughout the parenchyma. LCL (Psittacosis) bodies were found.

Spleen - focal areas of necrosis were seen.

Kidney - interstitial lymphocytic paravascular infiltration seen.

Other organs - no significant changes.

AFIP Diagnosis. Hepatitis, subacute, diffuse, mild to moderate, with multifocal necrosis, necrogranulomas, and intracellular coccobacillary microorganisms, liver, yellow nape Amazon parrot, avian, etiology--compatible with Chlamydia psittaci.

Conference Note. Attendees noted many random areas of coagulative necrosis which were thought due to Chlamydia. Other less numerous areas of caseous necrosis are surrounded by heterophils and occasionally multinucleated giant cells. These, attendees thought, may be due to a concurrent infection, possibly colibacillosis. All of the lesions seen in this case are reminiscent of those described in the liver of a parrot with psittacosis and concurrent colibacillosis (Raphael and Iverson, 1980). Special stains failed to demonstrate any infectious agents other than organisms suggestive of chlamydial elementary bodies within Kupffer cells and hepatocytes. These infected cells are not associated with the necrotic lesions. All of the organisms in this case are of similar size whereas in most cases of chlamydiosis a variation is noted representing initial, intermediate, and elementary bodies.

The differential diagnosis included Pacheco's disease (herpesvirus), mycobacteriosis, colibacillosis, and salmonellosis. Although colibacillosis and salmonellosis produce focal areas of necrosis, the necrosis is resolved by macrophages resulting in formation of necrogranulomas. It is of interest to note that parrots are often infected with human and bovine strains of mycobacteria because they are frequently kept as house pets. Therefore, in mycobacterial infection of the parrot, the numerous intralesional bacilli characteristically seen in avian TB, may instead be scant.

Contributor. Maryland Department of Agriculture, Animal Health Laboratory, 4901 Calvert Road, College Park, Maryland 20740.

Suggested reading.

Arnstein, P.; Meyer, K. F., revised by J. Schachter: Psittacosis and Ornithosis. In Diseases of Cage and Aviary Birds, M.L. Petrak, Ed., 2nd Ed., Lea & Febiger, 1982, p. 528.

Emerson, J. K.: Psittacosis. J. Am. Vet. Med. Assoc. 180: 612-613, 1982.

Mohan, R.: Epidemiologic and laboratory observations of Chlamydia psittaci infections in pet birds. J. Am. Vet. Med. Assoc. 184: 1372-1374, 1984.

Page, L. A.: Avian Chlamydiosis (Ornithosis). In Diseases of Poultry, 7th Ed., Chapt. 13, edited by M.S. Hofstad, Iowa State University Press, 1978, p. 337.

Raphael, B. L. and Iverson, W. O.: Coligranuloma and psittacosis in an Amazon parrot. J. Am. Vet. Med. Assoc. 177: 927-929, 1980.

Case III - 73862 (AFIP 1898516).

History. Tissue from a 3-1/2 year old Hartley strain guinea pig from a herd of TB-sensitized guinea pigs used for the safety testing of tuberculin. This animal was anorexic and losing weight with alopecia.

Gross Pathology. Kidneys had an irregular surface, were firm, and had multiple small cysts throughout the cortex and medulla; multiple, 2mm in diameter ulcers in stomach.

Laboratory Results.

BUN	37	mg/dl	Total Protein	4.4 gm/dl
Cholesterol	54	mg/dl	Albumin	2.4 gm/dl
Ca	12.5	mg/dl	Globulin	2.0 gm/dl
P	6.1	mg/dl	Na	142 meq/L
K	8.1	meq/l	Cl	112 meq/L
SGPT	11	mu/ml	SGOT	50 mu/ml

Contributor's Diagnosis & Comment. Diffuse, severe, chronic interstitial nephritis.

Diffuse involvement of the kidney was characterized by tubular ectasia with flattening of epithelial cells, interstitial fibrosis, mild interstitial mononuclear infiltrate, occasional hyalin tubular casts, hyalin droplets in some tubular epithelium, mineral deposits within tubular epithelium and tubular lumen, dilated Bowman's space, and mild capsular fibrosis of glomeruli. Special stains did not reveal a causative organism.

Although Klossiella cobayae and Encephalitozoon cuniculi have both been reported to be found in the guinea pig kidney, neither have been associated with histologic lesions. Leptospira have been isolated from guinea pigs but also have not been associated with interstitial nephritis.

CIN has been reported to be a common cause of death in pet guinea pigs but laboratory animals are rarely allowed to live long enough that lesions can be seen. The animals in this colony are kept until death once they are TB-sensitized, and this change has been seen in several pigs.

The clinical path changes of moderately elevated BUN and low total proteins is consistent with CIN although anorexia probably also contributed to the lower TP. The mildly elevated serum K+ would be consistent with a decreased ability of proximal tubular cells to excrete it.

AFIP Diagnosis. Nephritis, fibrosing, interstitial, chronic, diffuse, moderate, with tubular dilatation and cystic dilatation of Bowman's spaces, kidney, Hartley guinea pig, rodent.

Conference Note. Conference attendees noted multiple subcapsular indentations of the kidney surface indicative of surface pitting. Also noted was the size of the kidney which was enlarged up to two times that of a normal guinea pig (of unknown age). The identity of the globular, amorphous, eosinophilic material in the medullary and cortical interstitium was discussed; most attendees did not think this resembled amyloid. This material is slightly positive with a PAS procedure, and stains poorly with Congo red but shows "apple green" birefringence under polarized light. Based on these findings the Department of Chemical Pathology cannot positively identify it but states that amyloid cannot be ruled out. Attendees agreed that great care must be used in interpreting "apple green" birefringence. Other than occasional findings of glomerular atrophy, glomeruli were thought to be essentially normal.

The Department of Urogenital Pathology states that similar lesions are seen in man and that the etiology in these cases is likewise unknown. They think that the globular eosinophilic material is pathological and that these deposits in the

medulla probably cause tubular dilatation and cystic Bowman's spaces. They also see, in human kidneys, the brightly-eosinophilic cytoplasm present in many of the tubular epithelial cells and designate it "oncocytoid" change. The eosinophilia is due to finely-eosinophilic granules (probably mitochondria) as opposed to the larger globules seen with hyaline droplet change.

One study of age-related renal lesions in the guinea pig found the presence of deposits of IgG and complement in glomeruli (Steblay, Rudofsky, 1971), while in another study (Taketa, Grollman, 1970), nephrosclerosis due to vascular changes was seen. Also, changes seen in the latter study are said to be similar to those seen in man. Vascular lesions are not evident in this case.

Contributor. Office of Biologics, Food & Drug Administration, 8800 Rockville Pike, Bethesda, Maryland 20205.

Suggested reading.

Steblay, R. W., and Rudofsky, U.: Spontaneous renal lesions and glomerular deposits of IgG and complement in guinea pigs. J. Immunol. 107: 1192-1196, 1971.

Taketa, T., and Grollman, A.: Spontaneously occurring renal disease in the guinea pig. Am. J. Pathol. 60: 103-117, 1970.

Wagner, J. E.: Miscellaneous disease conditions of guinea pigs. In The Biology of the Guinea Pig. J.S. Wagner and P.J. Manning, Eds., Chapt. 16, Academic Press, 1976, p. 230.

Case IV - QA84-011 (AFIP 1947579).

History. Tissues were collected from a 2-year-old female $B_6C_3F_1$ mouse that had been on a chronic oral toxicity study for two years.

Gross Pathology. An oval mass, 15 x 15 x 5 mm, was located in the subcutaneous tissue of the right lateral abdominal region. The mass was firm and mottled red, dark red, and tan.

Contributor's Diagnosis & Comment. Carcinoma with squamous cell differentiation (adenoacanthoma), mammary gland, $B_6C_3F_1$ mouse, rodentia. Malignant lymphoma, mixed cell type, mammary gland, $B_6C_3F_1$ mouse, rodentia.

Because of limited tissue, the sections were prepared from two blocks from the same tumor.

The tumor is nodular, non-encapsulated, and characterized by the presence of neoplastic epithelial cells arranged in acinar, ductile, papillary, or comedo-like structures and sheets. The neoplastic epithelial tissue is separated by a rather sparse connective tissue stroma which contains irregularly arranged populations of neoplastic lymphocytes of mixed cell type. The neoplastic epithelial cells appear to be mammary gland epithelial cells. In many areas, the neoplastic epithelial cells have undergone squamous metaplasia and are forming nests or cystic spaces distended with keratin. Mineralization is also seen in some sections. Mitotic figures are prominent especially in neoplastic epithelium that has not undergone squamous metaplasia. Necrotic cells are scattered throughout the mass.

Adenoacanthomas are often invasive and/or occasionally metastasize to the lung. Metastases were not found in this animal.

Malignant lymphoma was found in spleen, lymph nodes, and mammary gland from this animal. The lymphoma was called a mixed-cell type. In some sections, the lymphoma may be difficult to subclassify or differentiate from lymphocytic infiltrates or lymphoid hyperplasia.

AFIP Diagnosis. Adenoacanthoma, mammary gland, $B_6C_3F_1$, mouse, rodent.

Conference Note. Many conference attendees were of the opinion that this tumor most closely resembles one of basal cell origin, particularly an adnexoma. Apocrine and occasionally sebaceous differentiation, abortive hair follicles lined by cells with prominent trichohyaline granules, and cell polarity were features discussed. Most sections contain at least a few acini of normal mammary gland at the periphery of the tumor. Attendees also discussed the possibility that these tumors arise from basal cells within the mammary gland. Prominent variably-sized aggregates of lymphocytes in the connective tissue of this tumor probably correspond to populations of neoplastic lymphocytes noted by the contributor in various other organs. However, a diagnosis of lymphoma could not be made based on the morphology of the lymphocytes in these tissue sections.

Other mammary neoplasms of the mouse were discussed, to include adenocarcinoma types A, B, and C. The former two are associated with the Bittner agent (mammary tumor virus, MTV), while the latter is usually not. Adenoacanthomas likewise are not generally associated with the Bittner agent.

The conference moderator stressed the importance of being familiar with the various strains of mice, each usually having particular pathological entities associated with it. The $B_6C_3F_1$ has a very low incidence of mammary neoplasms.

Contributor. Department of Pathology, Hazleton Laboratories, 3301 Kinsman Boulevard, Madison, Wisconsin 53704.

Suggested reading.

Dunn, T. B.: Morphology of mammary tumors in mice. In Physiopathology of Cancer. Homburger, F., Ed., Haper (Hoeber), New York, 1959, pp. 38-84.

Frith, C. H., and Wiley, L. D.: Morphological classification and correlation of incidence of hyperplastic and neoplastic hematopoietic lesions in mice with age. J. Gerontol. 36: 534-545, 1981.

Squartini, F.: Tumors of the mammary gland. In Pathology of Tumors in Laboratory Animals. Vol. II, Tumors of the Mouse, edited by V.S. Turusov, International Agency for Research on Cancer, 1979, p. 43.

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Results
AFIP Wednesday slide Conference - No. 7
24 October 1984

Conference Moderator: John D. Strandberg, DVM, PhD
Dipomate ACVP
Associate Professor
Comparative Medicine & Pathology
Johns Hopkins University School of Medicine
Baltimore, MD 21205

Case I - 62049 (AFIP 1945156).

History. An 8-year-old black and tan bitch was presented with a 6-month history of recurrent ascites and chronic weight loss and anemia.

Gross Pathology. At necropsy there was a liter of ascites fluid in the abdomen and hemorrhage in the distal small intestine and proximal colon. There was moderate verrucous endocardiosis of the right and left AV valves.

Laboratory Results. The animal was hypoproteinemic and anemic (normocytic hypochromic) with normal liver enzymes and BUN.

Contributor's Diagnoses & Comment. 1) Hepatitis, pericholangeal, subacute/chronic, nonsuppurative fibrosis, mild, pigment, mineralized trematode ova, Heterobilharzia americana. 2) Enteritis, mild, subacute/chronic, nonsuppurative, villous atrophy, mild, trematode ova, Heterobilharzia americana.

Ova of Heterobilharzia americana were found in the lamina propria and submucosa of all portions of the small intestine, cecum and colon. There was little hepatic parenchymal compromise and it was concluded that the hypoproteinemia, ascites, and anemia were the product of a protein-losing enteropathy and endoparasitism. The host inflammatory reponse to the ova was minimal in all organs involved; although in areas of the small intestine where ova were numerous the submucosa was thickened by mature connective tissue. Adult flukes were not observed.

AFIP Diagnoses. 1) Trematode eggs, predominantly portal, multifocal, with associated minimal granulomatous inflammation and moderate fluke pigment, liver, black and tan hound, canine. 2) Trematode eggs, multifocal, with associated minimal granulomatous inflammation, mucosa and submucosa, intestine; etiology--compatible with Heterobilharzia americana.

Conference Note. The microslide sections vary in the viability of eggs present in tissues. The inflammatory response to parasite eggs also varies somewhat, being totally absent in some sections, to a minimal granulomatous response in others. The lack of response indicates either an underlying immunologic problem in this particular animal, or that Heterobilharzia americana is a well-adapted parasite of the dog. Lee (1962) has shown that the dog, raccoon, hamster, and mouse are ideal hosts for this parasite, whereas the cat, guinea pig, and rabbit are unfavorable hosts. In the latter three, infective cercariae develop to adults, but eggs produced are not usually viable. The raccoon is considered the principle natural mammalian host; natural infections have also been described in the dog, nutria, opossum, white-tailed deer, bobcat, and swamp rabbit, and range from the southeastern U.S. to central Texas. Schistosomatium douthitti, the only other

mammalian schistosome endemic in the U.S., infects the mouse and is enzootic in Michigan, Minnesota, and Wisconsin. It is the schistosome egg which causes disease by evoking a granulomatous inflammatory response in the bowel and liver. Adult schistosomes appear to protect themselves from immunologic attack by incorporating host molecules into their integument as they mature.

Contributor. Department of Veterinary Pathology, College of Veterinary Medicine, Texas A&M University, College Station, Texas 77843.

Suggested reading.

Bartsch, R. C. and Ward, B. C.: Visceral lesions in raccoons naturally infected with Heterobilharzia americana. Vet. Path. 13: 241-249, 1976.

Goff, W. L. and Ronald, N. C.: Certain aspects of the biology and life cycle of Heterobilharzia americana in east central Texas. Am. J. Vet. Res. 42: 1775-1777, 1981.

Pierce, K. R.: Heterobilharzia americana infection in a dog. J. Am. Vet. Med. Assoc. 143: 496-499, 1963.

Thrasher, J. P.: Canine schistosomiasis. J. Am. Vet. Med. Assoc. 144: 1119-1125, 1964.

Lee, H. F.: Susceptibility of mammalian hosts to experimental infection with Heterobilharzia americana. J. Parasitol. 48: 740-745, 1962.

Warren, K. S.: The pathology, pathobiology and pathogenesis of schistosomiasis. Nature 273: 609-612, 1978.

Case II - 541 (AFIP 1947996) [EM slides (84-541) are included].

History. A young African Grey parrot was presented for necropsy following a 3-4 day clinical course consisting of lethargy, anorexia and diarrhea. The bird had been shipped from a Florida distributor one week prior to its death, at which time the bird was normal.

Gross Pathology. Significant gross lesions were confined to the liver, which was enlarged and mottled tan and red.

Laboratory Results. Upon bacterial culture, E. coli was obtained from the lung and intestine while there was no growth from the liver. Splenic impression smears were negative for Chlamydia sp. utilizing fluorescent antibody methods. Virus isolation attempts were unsuccessful.

Contributor's Diagnosis & Comment. Liver, necrosis, multifocal, severe, acute, due to reo-like virus.

The liver is characterized by numerous foci of hepatocellular necrosis which are becoming confluent in several areas. Remaining hepatocytes are regenerative with moderate nuclear pleomorphism and a few binucleate cells. An occasional portal triad contains a mild to moderate lymphocytic infiltrate. Scattered hepatocellular vacuolar change is evident.

Ultrastructural examination of thin sections of liver revealed many hepatocytes containing intracytoplasmic viral aggregates. Viral particles were round and composed of a moderately dense external ring around an electron dense core. Some empty capsid particles were present. Negative staining of processed fresh liver demonstrated 70 nanometer diameter viral particles as well. Morphology of the virus in negative staining preparations and by transmission electron microscopy was consistent with a reo-like virus which has been described in parrots.

AFIP Diagnosis. Necrosis, multifocal to coalescing, severe, liver, African gray parrot, avian.

Conference note. Aside from the numerous foci of necrosis present in all microslides, some microslide sections also contained occasional foci of caseous necrosis surrounded by heterophils and a few multinucleated giant cells. Special stains failed to demonstrate causative organisms in the granulomas, and these areas were considered due to an intercurrent disease, possibly colibacillosis.

Attendees discussed the common causes of viral necrotizing hepatitis in birds. Although the electronphotomicrographs do not indicate the size of the virus particles, they do demonstrate particles with some cubic symmetry, a dense central core, and no evidence of an envelope. In negatively stained micrographs of the virus, capsomeres cannot be distinguished. This is not the case for herpes and adenoviruses.

A recent study of Old World psittacine birds imported into Belgium revealed a widespread prevalence of orthoreoviruses. The primary lesions noted were hepatitis, enteritis, and pneumonia, resulting in up to 100% mortality of some shipments of imported birds (Meulemans et al., 1983).

Contributor. C. E. Kord Animal Disease Laboratory, P.O. Box 40627, Melrose Station, Nashville, Tennessee 37204.

Suggested Reading.

Ashton, W.L.G. et al.: Suspected reovirus - associated hepatitis in parrots. Vet. Rec. 114:476, 1984.

Mandelli, G. et al.: Experimental reovirus hepatitis in newborn chicks. Vet. Path. 15: 531-543, 1978.

Meulemans, G. et al.: Isolation of orthoreoviruses from psittacine birds. J. Comp. Path. 93: 127-134, 1983.

Valder, W. A.; Gauhl, C.; Luthgen, W. et al.: Viral liver disease in parrots. 1. Clinical, pathological, epidemiological observations and transmission experiments. Praktische. Tierarzt. 61: 127-129, 1980.

Winston, J. R. et al.: Isolation of a new reovirus from chum salmon in Japan. Fish Path. 15: 155-162, 1981.

Case III - Univ of Penn (AFIP 1948264) [Gross slide (84-028) is included].

History. A 2-year-old Basset hound was presented with a firm 6 cm x 4 cm mass within the subcutis of the left inguinal regional, and a history of weight loss, intermittent lameness, and pyrexia (104.9°) for two months. Signs were transiently responsive to antibiotic therapy. Popliteal lymph nodes were enlarged and the animal was icteric. Biopsy of the inguinal mass revealed chronic-active cellulitis. The animal was hospitalized, no improvements were noted, and the dog was euthanatized.

Gross Pathology. The animal was emaciated and icteric. Popliteal lymph nodes were enlarged. One large 6 cm x 2 cm mass was present within the subcutis of the left inguinal area. Internal lymph nodes and spleen were enlarged and firm. The liver was approximately three times normal size, mottled tan/brown, friable, and had an accenuated lobular pattern. (Gross photo).

Laboratory Results.

Hematocrit	24%
WBC	44,100/mm^3
Segs	41,895/mm^3
Lymp	1,323/mm^3
Mono	882/mm^3
Total Bilirubin	1.4
Direct Bilirubin	.7
SAP	1440 iu/
Coomb's	Neg (IgG, IgM, C_3)

Contributor's Diagnoses & Comment. 1) Severe, diffuse hepatic amyloidosis. 2) Multifocal granulomatous hepatitis - Mycobacterium avium type IV. 3) Severe, diffuse granulomatous splenitis - Mycobacterium avian type IV.

The liver contained large amounts of eosinophilic fibrillar material (amyloid) within the sinusoids. There was marked atrophy of the hepatic plates. Scattered periportal and centrilobular accumulations of lymphocytes, macrophages and occasional neutrophils were evident. Mild biliary ductal hyperplasia was present.

The spleen contained infiltration of the parenchyma by macrophages, epithelioid cells, and occasional multinucleate giant cells. Foci of neutrophils and cellular debris were scattered throughout the sections. Perivascular accumulations of amyloid were evident.

Additional findings in this animal included perivascular amyloid accumulation within the lamina propria of the small intestine and mild glomerular amyloid deposition. A granulomatous reaction was present within the popliteal and visceral lymph nodes and within the subcutaneous mass.

In Congo red stained sections of the liver, spleen, and small intestine, the sinusoidal and perivascular eosinophilic fibrillar material was orange and had light green birefringence when viewed with polarized light, consistent with amyloid. In Ziehl-Neelsen stained sections of spleen, liver, popliteal and internal lymph nodes and the inguinal mass, variable numbers of long, slender acid-fast organisms were present within macrophages and epithelioid cells. Growth of Mycobacterium avium type IV was obtained from lymph node cultures using the Herrold/egg yolk slant method by the Mycobacterium and Brucella section of the National Veterinary Service Laboratory, Ames, Iowa.

AFIP Diagnosis. Amyloidosis, diffuse, moderate to severe, with mild subacute perivasculitis, liver, basset hound, canine.

Conference Note. A Congo red stain of the liver demonstrates very faint orange coloration of the sinusoidal fibrillar material. The Department of Histochemistry states that despite the weak staining of this material, it displays a green birefringence under polarized light and is consistent with amyloid. Most attendees thought this material was subendothelial in location. A Ziehl-Neelsen demonstrates acid fast bacteria (AFB) within a few phagocytic cells in one portal area.

The Ziehl-Neelsen stains of the spleen demonstrate numerous AFB throughout. An H&E of the spleen reveals occasional foci of caseous necrosis and a single granuloma. This granuloma was found to contain numerous AFB. Additionally, there are numerous neutrophils throughout the spleen.

A differential diagnosis to include other species of Mycobacterium and also Nocardia, was discussed by attendees. Nocardia has a more beaded and filamentous appearance than other AFB; M. bovis and M. tuberculosis, although more common in the dog than M. avium, are not as numerous within phagocytes as the AFB in this case.

Despite resistance of dogs to infection by M. avium, even experimentally, there are several recent reports of natural infections. It is suspected that infection usually occurs as a result of a defect in cell-mediated immunity, and that organisms often enter through the gastrointestinal tract.

Contributor. University of Pennsylvania School of Veterinary Medicine, 3800 Spruce Street, Philadelphia, Pennsylvania 19104.

Suggested reading.

Chopra, S.; Rubinow, A.; Koff, R. S. et al.: Hepatic amyloidosis - a histopathologic analysis of primary (AL) and secondary (AA) forms. Am. J. Path. 115(2): 186-193, 1984.

Beumont, P. R.; Jezyk, P. F., and Haskins, M. E.: Mycobacterium avium infection in a dog. J. Sm. Anim. Pract. 22: 91-97, 1981.

Feldman, W. H.: The pathogenicity for dogs of bacilli of avian tuberculosis. J. Am. Vet. Med. Assoc. 76: 399-419, 1930.

Friend, S.C.E. et al.: Infection of a dog with Mycobacterium avium serotype II. Vet. Path. 16: 381-384, 1979.

Glenner, G. C.: Amyloid deposits and amyloidosis. New Eng. J. Med. 302(23): 1283-1292; 302(24): 1333-1343, 1980.

Jakob, W.: Spontaneous amyloidosis of mammals. Vet. Path. 8: 292-306, 1971.

Kisilevsky, R.: Amyloidosis: A familiar problem in light of current pathogenetic developments. Lab. Invest. 49: 381-387, 1983.

Walsh, K. M. and Losco, P. E.: Canine mycobacteriosis: A case report. J. Am. Anim. Hosp. Assoc. 20: 295-299, 1984.

Wolinsky, E.: Nontuberculous mycobacteria and associated diseases. Am. Rev. Resp. Dis. 119: 107-159, 1979.

Case IV - 39326N (AFIP 1944525).

History. A 3-year-old DSH male cat was presented with ataxia, anorexia, and a head tilt which had an acute onset about 10 days prior to admission. Physical examination revealed bilateral multifocal, white, raised fundic lesions in both the tapetal and nontapetal regions. There was no nystagmus and the cat had normal reflexes and muscle strength.

Gross Pathology.

After 10 days with no signs of clinical improvement the cat was euthanatized. The only gross lesions at necropsy were multifocal, small (2-5 mm) white nodules scattered throughout the mesentery.

Laboratory Results.

Serum antibody titers included:

FIP	1;1000
Toxoplasma	no titer
Blastomyces	no titer
Histoplasma	no titer
Cryptococcus	no titer

The cat was negative for feline leukemia virus, and had a normal WBC. Culture of the left eye produced pure colonies of Candida albicans.

Contributor's Diagnosis & Comment. Encephalitis, subacute, multifocal, moderate, cerebrum, Candida albicans.

Morphologically, the organisms in the cerebrum were 4-8 um blastospores with irregular, narrow-based budding and occasional pseudohyphae (rare in these sections). In addition to the cerebral lesions, there was a multifocal pyogranulomatous retinitis, nephritis and peritonitis. Similar organisms were found in all of these tissues.

AFIP Diagnosis. Polioencephalitis, perivascular, granulomatous, multifocal, mild, with intralesional fungal yeasts, cerebrum, brain, domestic short hair, feline.

Conference Note. Conference attendees noted a predominantly perivascular distribution in this infection. The differential diagnosis includes histoplasmosis, microsporidiosis, and toxoplasmosis. The size variation and refractile wall of organisms in this case help to rule out Histoplasma. Organism size, staining (H&E) and location are not characteristic of Microsporidium, nor is the morphology compatible with Toxoplasma. Several attendees considered sporotrichosis which is rarely disseminated and usually stimulates a more pronounced host response. Additionally, there was possibly some fibrosis and mineralization of the meninges, probably unrelated to the disease process.

Disseminated candidiasis is rare and often associated with prolonged immunosuppression, antibiotic therapy, diabetus mellitus, and/or intravenous catheterization. Circulating neutrophils are thought to be a major defense against candidiasis; dissemination, therefore, is seen in neutropenic humans and dogs with experimentally-induced neutropenia. Once bloodborne, organisms are filtered by lungs, liver, and kidneys, and also by the microcirculation of peripheral tissues such as muscle and skin. Embolic colonization results at these sites.

Lipton et al. (1984) have found Candida to be the most prevalent cause of human cerebral mycosis. A clue to central-nervous-system candidal infections is a strikingly high percentage of patients who also have myocardial or valvular endocardial infections. Parenchymal presentations have included thrombosis, vasculitis, abscess, hemorrhage, demyelination, and two previously unrecognized lesions: fungus balls in both the white and gray matter, and mycotic aneurisms.

Contributor. Department of Pathology and Parasitology, Auburn University School of Veterinary Medicine, Auburn, Alabama.

Suggested reading.

Lipton, S. A. et al.: Candidal infection in the central nervous system. Am. J. Med. 76: 101-108, 1984.

McCausland, I. P.: Systemic mycoses of two cats. New Zealand Vet. J. 20: 10-12, 1972.

McCaw, D. et al.: Pyothorax caused by Candida albicans in a cat. J. Am. Vet. Med. Assoc. 185: 311-312, 1984.

Soltys, M. A., and Sumner-Smith, G.: Systemic mycoses in dogs and cats. Canad. Vet. J. 12: 191-199, 1971.

Stone, H. H.; Kolb, L. D.; Currie, C. A. et al.: Candida sepsis: Pathogenesis and principles of treatment. Ann. Surg. 179: 697-711, 1974.

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Results
AFIP Wednesday Slide Conference - No. 8
31 October 1984

Conference Moderator: Ronald W. Trotter,
MAJ, VC, USA
Diplomate, ACVP
Department of Veterinary Pathology
Armed Forces Institute of Pathology
Washington, DC 20306

Case I - 83-1606-3 (AFIP 1944384).

History. An 11-year-old male Manx cat presented with abdominal distension of one month's duration.

Gross Pathology.
The gallbladder had been removed during an exploratory laparotomy. A mass was discovered at the hilus of the liver in the area of the bile duct involving several adjacent lobes of liver. At necropsy remnants of a neoplastic mass were found at the ligated stump of the bile duct and involving several centimeters of adjacent liver. No neoplasia was found in any other organs.

Laboratory Results. The abdominal fluid was classified as a modified transudate on cytologic examination.

Contributor's Diagnosis & Comment. Carcinosarcoma of the bile duct.
Microscopically, the neoplasm is a mixture of elliptical cells in bundles interspersed with focal areas of small ducts. The elliptical cells stain positive for smooth muscle with Van Gieson and a few of the small ducts stain with the Luna-Ishak method for bile. Thus there is both leiomyosarcoma and bile duct carcinoma making the diagnosis carcinosarcoma.

The origin of this neoplasm is believed to be within the cystic or common bile duct. The section submitted shows a muscular wall of a tubular structure along one edge, and some sections have an epithelial lining covering this muscular layer. Other sections (not submitted) show the neoplasm within the muscular wall of the gallbladder.

Mixed tumors of both mesenchymal and epithelial components are reported most commonly in mammary and salivary glands, and are usually benign. Malignant mixed tumors also occur but only one component is usually malignant, most often the epithelial tissue.

AFIP Diagnosis. Leiomyosarcoma, stump of bile duct (per contributor), Manx, feline.

Conference Note. The presence of large nerve trunks and thrombosed or necrotic arteries throughout the mass and well-differentiated smooth muscle in one peripheral area of the mass is consistent with the with the necropsy observations that the mass involved the ligated stump of the bile duct.

The attendees noted elongated spindle cells arranged in prominent bundles, and most were of the opinion that this neoplasm was a leiomyosarcoma. The Department

of Soft Tissue Pathology, AFIP, also thought this neoplasm was most likely to be a leiomyosarcoma.

The ductular structures in microslides examined by conference attendees were interpreted by most attendees as pre-existing; however, some attendees considered a diagnosis of carcinosarcoma due to the wide spacing of the glandular elements and occasional bizarre-looking epithelial cells. The Department of Hepatic Pathology, AFIP, also considered the glandular structures to be benign or reactive.

Leiomyosarcomas are more common in cats than other species; cholangiocellular carcinomas also occur in the cat, but carcinosarcomas involving these two neoplasms have not been reported in this species, and are rarely reported in man. Brief reviews of current concepts on the histiogenesis of carcinosarcomas may be read in recent papers by Huszar et al. (1984) and by Born et al. (1984).

Contributor. Division of Pathobiology, College of Veterinary Medicine, Virginia Tech, Blacksburg, Virginia 24061.

Suggested reading.

Born, M. W.; Ramey, W. G.; Ryan, S. F. et al.: Carcinosarcoma and carcinoma of the gallbladder. Cancer 53: 2177-2177, 1984.

Huszar, M.; Herczeg, E.; Lieberman, Y. et al.: Distinctive immunofluorescent labeling of epithelial and mesenchymal elements of carcinosarcoma with antibodies specific for different intermediate filaments. Hum. Path. 15: 532-538, 1984.

Moulton, J. E. (Ed.): Tumors in Domestic Animals. 2nd Ed., University of California Press, Berkeley, 1978.

Case II - 83-230 (AFIP 1948535).

History. Tissue from an 8-month-old spayed female, lilac point Himalayan cat the ataxia, anterior uveitis and chorioretinitis. The course deteriorated to point where the cat was euthanatized.

Gross Pathology. Bilateral corneal protrusion with central (2-3mm) erosions. Liver faintly mottled with scattered, barely visible, grey-white foci. Left kidney has a group of 2-3mm, raised nodules along the anterolateral midline.

Laboratory Results. Antibody titer to Infectious Feline Peritonitis virus at the time of admission was $\geq$ 1:68000.

Contributor's Morphologic Diagnosis & Comment. Hydrocephalus. Ependymitis, granulomatous, chronic. Choroiditis, granulomatous, chronic. Leptomeningoencephalitis, granulomatous, chronic. Vasculitis. Interstitial brain edema.

Etiologic Diagnosis: Feline Infectious Peritonitis Virus. FIP (CNS form).

Lateral ventricles are bilaterally dilated. A moderate to marked inflammatory cell infiltrate involves the ependymal lining of the ventricles and extends into the adjacent white matter and neuropil. Most of these cells are lymphocytes and plasma cells with lesser numbers of macrophages and neutrophils. Cells are frequently located perivascularly but do not appear to be directly affecting vessels except small veins which are necrotic and have eosinophilic material exuding from them indicative of protein loss. The ependymal lining is distorted because of the inflammatory process. In several areas, ependymal cells are absent. The brain parenchyma adjacent to the ventricles is pale and vacuolated.

In more severely affected areas, there is a marked gemistocytic gliosis and numerous axonal spheroids. Cavitation is approached in the most affected areas. The cerebral cortex peripheral to the periventricular area is considerably less affected. A mild inflammatory cell infiltrate can be identified in the leptomeninges.

AFIP Diagnoses. 1) Periventriculitis and ependymitis, granulomatous, diffuse, severe, with malacia, hydrocephalus, and diffuse subependymal perivasculitis, cerebrum, lilac point Himalayan, feline. 2) Leptomeningitis, granulomatous, multifocal, minimal to mild, cerebrum, etiology--compatible with feline coronavirus (FIP).

Conference Note. Conference attendees noted a variation in the tissue sections submitted; in some sections, the periventriculitis contains more neutrophils than others and was therefore diagnosed as pyogranulomatous. The inflammation of the meninges is limited to the ventral cerebral surface in many sections, while in others it extends deep into the ventral longitudinal fissure.

The possible causes of the hydrocephalus seen in this case were discussed. In man, hydrocephalus is a frequent sequela to sclerosis of the cerebral aqueduct following infection by reo- and coxsackie viruses. Attendees speculated as to a similar effect by feline coronavirus. In still other infections, obstruction to the flow of CSF is caused by fibrosis of the subarachnoid meninges and vessels, leading to reduced absorption of CSF.

Pedersen (1984) and August (1984) have recently written up-to-date summaries of feline coronavirus disease. These papers are worthy of review. In the cat, the FIP coronavirus has a tropism for tissue macrophages, blood monocytes, and reticuloendothelial cells. The serum antibody produced in the various forms of the disease is not neutralizing but opsonizes the virions facilitating their phagocytosis by target cells within which viral replication then takes place. In some animals, the lack of cell-mediated immunity with the presence of high serum antibody levels results in immune-complex disorders and abundant effusions characteristic of the effusive form of this disease. In those animals with a partial cell-mediated immunity, the virus-infected macrophages are "walled-off" by a granulomatous inflammatory response in target organs, resulting in the noneffusive form of the disease. Those animals which develop a stong cell-mediated immunity are able to suppress the infection; however, virus-infected macrophages can persist, and the latent infection may be reactivated by stress or immunosuppression (FeLV, glucocorticoids, etc.).

Contributor. School of Veterinary Medicine, North Carolina State University, Raleigh, North Carolina 27606.

Suggested reading.

August, J. R.: Feline infectious peritonitis: An immune-mediated coronaviral vasculitis. In The Veterinary Clinics of North America, Small Animal Practice, Vol 14(5), Saunders, 1984, p. 79.

Krum, S.; Johnson, K., and Wilson, J.: Hydrocephalus associated with the noneffusive form of Feline Infectious Peritonitis. J. Am. Vet. Med. Assoc. 167(8): 746-758, 1975.

Pedersen, N. C.: Feline coronovaris infections. IN Clinical Microbiology and Infectious Diseases of the Dog and Cat. Chapt. 29, C. E. Green, (Ed.), Saunders, 1984, p. 514.

Pratt, P. W.: Feline Medicine. 1st Ed., Am. Vet. Publ., Inc., 1983, 116-123.

Case III - 84-1680 (AFIP 1944299).

History. A 12-year-old mixed breed bitch presented with 2-month history of anorexia, polydipsia, polyuria and lethargy. A perirectal mass was detected on physical exam.

Gross Pathology.

A mass detected clinically was surgically removed. It was apparently well demarcated, lobulated, tan, and ovoid (3x2x4 cm).

Laboratory Results.

Serum calcium was 13.7 mg/dl 24 hours prior to surgery and 10.6 mg/dl 24 hours post-surgery.

Contributor's Diagnosis & Comment. Adenocarcinoma of apocrine glands of anal sac with tumor associated hypercalcemia.

Sections markedly vary in the ratio of solid to glandular tissue. A poor prognosis was given because of the high rate of recurrence and metastasis expected with this neoplasm.

AFIP Diagnosis. Adenocarcinoma, tubulosolid, apocrine, perirectal (per contributor), mixed breed, canine.

Conference Note. All Conference attendees diagnosed apocrine gland adenocarcinoma based on the histomorphology of the bimorphic tumor (solid and glandular patterns) and the history of hypercalcemia which resolved after tumor excision. A differential diagnosis of endocrine neoplasm, based upon the endocrine-like "nesting" of the cells, can be ruled out because of the overall morphology and polarity of the cells.

Pseudohyperparathyroidism (PHP) of malignancy in the dog is most commonly associated with lymphosarcoma, but is also seen in adenocarcinomas of the apocrine glands of the anal sacs, mammary gland adenocarcinomas, and pancreatic carcinomas. The effectors of hypercalcemia are currently the subjects of intensive research. In man, osteoclast-activating factor (OAF) is a product of normal lymphocytes, and is known to increase in multiple myeloma and lymphoma (Potts, 1983). Prostaglandins, especially of the E series, may be locally-active mediators of bone resorption and have been associated with PHP in neoplasms of man, mice, and rabbits (Meuten, et al., 1981). The hypercalcemia in dogs with adenocarcinoma of the apocrine glands of the anal sacs appears to be due to a factor distinct from OAF, prostaglandins, PTH, and vitamin D, but is thought to alter vitamin-D metabolism by increasing the activity of 1 alpha-hydroxylase in the kidney (Meuten, Capen, Kociba, Cooper, 1982).

Bone changes due to PHP show no increases in osteoblasts or in osteoid seams in contrast to changes produced by hyperparathyroidism. Direct tumor involvement of bone is not a feature of PHP.

Contributor. Department of Veterinary Pathobiology, College of Veterinary Medicine, Ohio State University, Columbus, Ohio 43210.

Suggested reading.

Hause, W. R.; Stevenson, S.; Meuten, D. J. et al.: Pseudohyperparathyroidism associated with adenocarcinomas of anal sac origin in four dogs. J. Am. Anim. Hosp. Assoc. 17: 373-379, 1981.

Meuten, D. J.; Cooper, B. J.; Capen, C. C. et al.: Hypercalcemia associated with an adenocarcinoma derived from the apocrine glands of the anal sac. Vet. Path. 18: 454-41, 1981.

Meuten, D. J.; Segre, G. V.; Capen, C. C. et al.: Hypercalcemia in dogs with adenocarcinoma derived from apocrine glands of the anal sacs: Biochemical and histomorphometric investigations. Lab. Invest. 48: 428-435, 1983.

Meuten, D. J.; Capen, C. C.; Kociba, G. J. et al.: Animal model of human disease: Hypercalcemia of malignancy; hypercalcemia associated with an adenocarcinoma of the apocrine glands of the anal sacs. Am. J. Path. 108: 366-370, 1982.

Meuten, D. J.; Capen, C. C.; Kociba, G. J. et al.: Ultrastructural evaluation of adenocarcinomas derives from apocrine glands of the anal sac associated with hypercalcemia in dogs. Am. J. Path. 107: 167-175, 1982.

Norrdin, R. W., and Powers, B. E.: Bone changes in hypercalcemia of malignancy in dogs. J. Am. Vet. Med. Assoc. 183: 441-444, 1983.

Potts, J. T. Jr.: Disorders of the parathyroid glands. In Harrison's Principles of Internal Medicine. Petersdorf, Adams et al. (Eds.), Chapt. 339, 10th Edition, McGraw Hill, 1983, p. 1934.

Rijnberk, A.; Elsinghorst, A. M.; Koeman, J. P. et al.: Pseudohyperparathyroidism associated with perirectal adenocarcinomas in elderly female dogs. Tijdschr. Diergeneeskd. 103: 1069-1075, 1978.

Case IV -N20820A (AFIP 1902445).

History. A 9-year-old M/C Basenji canine developed polyuria/polydypsia on 2/82. In April 1983 this dog had 4+ glucosuria with a blood glucose level of 100 mg/dl. It was also hypothyroid (T_4 = 1.6). At this time Fanconi-like syndrome was suspected. In June 1983 the dog was presented in renal failure; and subsequently died.

Gross Pathology. There was ulceration in the oral cavity and gastric hemorrhage. The kidneys were slightly smaller than normal and had unevenly narrowed cortices. The capsule stripped cleanly, but the cranial pole of the left kidney was distorted by a segmental cleft and a cone-shaped depression, which was about .5x1 cm. The tips of the renal papillae were pale.

Laboratory Results.

Clinical parameters on 6/28/83 were: SAP: 43 mu/ml, creatinine 6.7 mg/dl, BUN 138 mg/dl, serum phosphorus 8.3 mg/dl, serum Ca 12.9 mg/dl, albumin 3.9 gm/dl, serum chloride-91 meq/l, serum sodium 130/meq/l, serum potassium 5.1/meq/l.

Contributor's Diagnosis & Comment. Nephropathy, tubulointerstitial, chronic, diffuse with convoluted tubule epithelial karyomegaly and renal papillary necrosis, acute, bilateral, consistent with Fanconi-like syndrome (renal tubular dysfunction defect) of Besenji dogs.

Kidney - There is moderate to marked diffuse interstitial fibrosis. Many convoluted tubules contain either numerous hyaline droplets or some necrotic epithelium; most convoluted tubules contain attenuated epithelium which have huge hyperchromatic nuclei with large, eosinophilic nucleoli; some of these karyomegalic nuclei are up to 30 microns in diameter. There are a few obsolescent glomeruli, but most glomeruli appear fairly normal. Many collecting ducts in the medulla contain granular hyaline casts. The distal 1/3 of the renal papilla is necrotic; at the junction with viable tissue, there is a zone of neutrophils.

AFIP Diagnoses. 1) Fibrosis, interstitial, cortical, moderate, kidney, Basenji, canine. 2) Tubular degeneration and necrosis, diffuse, moderate, with mild multifocal subacute interstitial nephritis, and multifocal tubular karyomegaly, kidney. 3) Necrosis, coagulative, diffuse, severe, renal papilla, kidney, etiology--consistent with ischemia.

Conference Note. In addition to the histomorphologic changes included in the morphologic diagnoses, attendees noted a wedge-shaped focus of sclerosis in the superficial cortex with an overlying depression of the kidney surface which is consistent with an infarct. Additionally in the cortex, there is random tubular loss and occasional eosinophilic casts. Attendees thought that the papillary necrosis was probably due to either a severe reduction in blood supply as a result of prolonged dehydration, or to drugs with anti-prostaglandin activity, or to electrolyte imbalances, or a combination of these.

Renal tubular dysfunction (RTD) has been reported in Basenjies and several other breeds of dog, and has been compared to idiopathic Fanconi (De Toni-Debre-Fanconi) Syndrome in man described by Heptinstall (1974). A study by Breitschwerdt, Ochoa, and Waltman (1983), however, suggests that the pathogenesis of RTD in the Basenji may be due at least in part to hypercortisolism. In addition to documented renal tubular transport defects (including glucose, amino acids, phosphate, sodium, potassium, and uric acid), Basenjies with RTD have an antidiuretic hormone-resistant urinary concentrating defect indicative of nephrogenic diabetes insipidus. Hyperadrenocortisolism is thought to contribute to the urinary-concentrating defect via several mechanisms. Any relationship between these renal deficiencies and other possibly inherited disorders of the Basenji (endocrine abnormalities, gastropathy, and lymphocytic-plasmacytic enteritis), has not yet been clarified.

Contributor. Department of Veterinary Patobiology, University of Minnesota, St. Paul, Minnesota 55108.

Suggested reading.

Bovee, K. C. et al.: Characterization of renal defects in dogs with a syndrome similar to Fanconi syndrome in man. J. Am. Vet. Med. Assoc. 174: 1094-1099, 1979.

Bovee, K. C. (Ed.): Genetic and metabolic diseases. In Canine Nephrology. Chapt. 16, Harvard Publ. Co., 1984, p. 343.

Breitschwerdt, E. B. et al.: Multiple endocrine abnormalities in Basenji dogs with renal tubular dysfunction. J. Am. Vet. Med. Assoc. 182: 1348-1353, 1983.

Easley, J. R. et al.: Glucosuria associated with renal tubular dysfunction in three Basenji dogs. J. Am. Vet. Med. Assoc. 168: 938, 1976.

Heptinstall, R. H.: Sundry conditions affecting renal tubules. In Pathology of the kidney. 2nd Ed., Chapt. 27, Little, Brown & Co., 1974, p. 1067.

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Results
AFIP Wednesday Slide Conference - No. 9
7 November 1984

Conference Moderator: William C. Hall, VMD, PhD
Diplomate, ACVP
Microbiological Associates
5221 River Road
Bethesda, MD 20816

Case I - 82-0011 (AFIP 1950246).

History. Tissue from a 129/J mouse. Mice were controls from a vaccine study, inoculated with Sendai virus. They were unvaccinated and represent positive controls. The test was to determine the effectiveness of Sendai vaccine. They were killed 12 days following inoculation.

Gross Pathology. Multiple areas of atelectasis were observed and associated with white irregularly-shaped 1-3 mm foci.

Contributor's Diagnosis & Comment. Bronchiolitis, proliferative, with squamous metaplasia, moderate to severe. Interstitial pneumonia, multifocal, with squamous metaplasia, moderate to severe.

This response is characteristic of Sendai-infected mice of the 129/J strain. This strain is highly susceptible to lethality from infection with Sendai virus. Necrotizing changes of airways typical of Sendai in more resistant mouse strains occur earlier in resistant mouse strains compared with the 129/J. Nude athymic mice develop similar lesions to these of the 129/J.

AFIP Diagnosis. Bronchiolitis and peribronchial pneumonitis, proliferative, subacute, minimal to moderate, with squamous metaplasia, lung, 129/J mouse, rodent, etiology--compatible with Sendai virus.

Conference Note. The differential diagnosis discussed included Mycoplasma and neoplasia. In infections caused by Mycoplasma pulmonis, nodules of exuberant lymphoid tissue are prominent around bronchi and bronchioles; such nodules are not evident in this case. Another feature of Mycoplasma infections is the terminal bronchiolar ectasia with abundant intraluminal neutrophils, also not evident in this case. Many attendees considered neoplasia of the alveolar and bronchiolar epithelial cells due to the marked proliferation of these cells. However, the multifocal peribronchiolar pattern of proliferation which extends out into alveoli is not typical of a primary lung neoplasm.

The proliferative response of bronchiolar and alveolar epithelial cells is probably never seen in rats, and is also unusual in the mouse with the exception of the several strains (to include the 129/J) that are susceptible to Sendai virus (Parker, Whiteman, Richter, 1978) (Brown-Stein et al., 1981). In susceptible strains, airway and alveolar epithelial proliferation occurs first, followed later

by necrosis. In nonsusceptible strains necrosis often occurs first, followed by reparative epithelial proliferation. Necrosis of infected cells is thought to be due to a delayed immunological response (immune complex plus complement) rather than to a primary effect of the virus.

Numerous syncytial cells are also evident in affected areas of the lung in this case. Paramyxoviruses contain a fusion (F) protein on the virion surface that induces fusion of virion with plasma membrane once attachment is established by hemagglutinin. Susceptibility of host cells depends upon their content of proteases which cleave F into two fragments. When adjacent host cells generate large amounts of F fragments, their plasma membranes may reduplicate and be induced to fuse, resulting in syncytial cells. In this way, it is believed, the virus can spread from cell to cell without being exposed to host immune surveillance (Cheville, 1983).

Contributor. Microbiological Associates, 5221 River Road, Bethesda, Maryland 20816.

Suggested reading.

Brownstein, D. G.; Smith, A. L.; Johnson, E. A.: Sendai virus infection in genetically resistant and susceptible mice. Amer. J. Path. 105: 156-163, 1981.

Castleman, W. L.: Respiratory tract lesions in weanling outbred rats infected with Sendai virus. Am. J. Vet. Res. 44: 1024-1031, 1983.

Cheville, N. F.: Cell Pathology. 2nd Ed., Iowa State University Press, 1983, pp 105, 451.

Parker, J. C., and Richter, C. B.: Viral diseases of the respiratory system. In The Mouse Biomedical Research, Vol. II, Foster, Small, Fox, (Eds.), Academic Press, New York, pp 109-158.

Parker, J. C.; Whiteman, M. D.; Richter, C. B.: Susceptibility of inbred and outbred mouse strains to Sendai virus and prevalence of infection in laboratory rodents. Infect. Immunol. 19: 123-130, 1978.

Case II - 84488 (AFIP 1947581). (Gross slide is included).

History. A 2-year-old mixed breed steer from a large University-herd known to be persistently infected with bovine viral diarrhea virus. The steer had been vaccinated with a modified live virus BVD vaccine on 1 Dec 83. No clinical abnormalities were noted after vaccination. On 16 Jan 84 the animal was exposed to virulent cytopathic BVD virus. It was clinically normal until 15 Mar 84 when it developed anorexia, dehydration and severe, watery diarrhea. It deteriorated progressively and was killed 22 Mar 84 after developing respiratory signs.

Gross Pathology. Approximately 20% of total lung volume was affected with severe, subacute, serofibrinous pneumonia (slide 84437). In addition there were erosions and ulcers of mucosae overlying the intestinal lymphoid areas, ulcers of the abomasum and thickening of the distal ileum, cecum, and proximal colon. Kidneys were enlarged and pale.

Laboratory Results. Lung tissue at necropsy: Pasteurella multocida, 7×10^9 CFU/gram of lung tissue.
Blood immediately prior to death: 2560 BVD-infectious units/ml.
BVD neutralization titers: Against noncytopathic virus (Nebraska, autogenous): < 4
Against cytopathic virus (Singer strain): 1024/ml

Contributor's Diagnosis & Comment. Severe, subacute, multifocal serofibrinous-to-fibrinohistiocytic pneumonia Pasteurella multocida.
This steer had chronic persistent infection with noncytopathic BVD virus. Challenged with virulent cytopathic BVD virus, it developed the chronic "mucosal disease" form of bovine viral diarrhea. Because of severe acquired viral-induced immunodeficiency, the animal developed disseminated necrobacillosis due to Fusobacterium necrophorum and pneumonia caused by Pasteurella multocida.

The current hypothesis is that cattle become persistently infected with noncytopathic BVD virus after in utero infection. When, in post-natal life, they become infected with a cytopathic virus, then mucosal disease ensues.

AFIP Diagnosis. Pneumonia, fibrinocellular, diffuse, severe, with colonies of coccobacilli, lung, Hereford, bovine, etiology--compatible with Pasteurella spp.

Conference Note. Discussion centered on the identity of clusters and whorls of spindle cells within bronchioles and alveoli. Some attendees considered these to coincide with the oat-shape macrophages described by Jubb and Kennedy (1970, Vol 1, p. 202) who believe these cells to be derived from monocytes. Once these cells enter the alveoli, their cytoplasm increases in volume and they elongate and aggregate to form whorls which extend into adjacent alveolar ducts and respiratory bronchioles. When these cells are accompanied by fibrin, the inflammation is sometimes termed "fibrinocellular". Some pathologists associate oat-shaped cells with chronicity.

Pasteurella spp are a normal part of the upper respiratory tract flora of ruminants, but are not normally present in the lung. Viral infections, to include BVD, PI_3, and IBR, especially if augmented by stress, render cattle more susceptible and enhance the proliferation of Pasteurella in the upper respiratory tract. These bacteria are inhaled into alveoli where some (Pasteurella hemolytica) are capable of killing alveolar macrophages. Release of biologically-active substances from dying macrophages causes inflammation and deposition of fibrin. Endotoxin elaborated in the case of Pasteurella hemolytica is thought to be a major initiator of the lesions. A study by Schiefer, Ward, and Moffatt concluded that lesions of P. hemolytica fulfill the criteria of a fibrinous pleuropneumonia, whereas those of P. multocida are more typically bronchopneumonia with moderate amounts of fibrin.

Discussion of other causes of fibrinous pneumonia in cattle included Hemophilus and Mycoplasma. In other species which do not have septae to contain the

infection, Streptococcus is the classic cause of lobar pneumonia. Klebsiella is also a common cause in laboratory animals.

Contributor. National Animal Disease Center, P.O. Box 70, Ames, Iowa 50010.

Suggested reading.

Liess, B. et al.: Bovine Virusdiarrhoe (BVD). Dtsch. Tierarzt. Wschr. 90: 261-266, 1983.

Rehmtulla, A. J., and Thompson, R. G.: A review of the lesions in shipping fever of cattle. Can. Vet. J. 22: 1-8, 1981.

Schiefer, B.; Ward, G. E.; Moffatt, R. E.: Correlation of microbiological and histological findings in bovine fibrinous pneumonia. Vet. Path. 15: 313-321, 1978.

Slocombe, R. F.; Dirksen, F. J., et al.: Interactions of cold stress and Pasteurella hemolytica in the pathogenesis of pneumonic pasteurellosis in calves: Method of induction and hematologic and pathologic changes. Am. J. Vet. Res. 45: 1757-1763, 1984.

Steck, F. et al.: Immune responsiveness in cattle fatally affected by bovine virus diarrhea-mucosal disease. Zbl. Vet. Med. B 27: 429-445, 1980.

Case III - 72890 [2 slides] (AFIP 1849470).

History. Adult female rhesus monkey approximately 12 yrs., in large free ranging monkey colony, noted with enlargement surrounding right femur.

Contributor's Diagnosis & Comment. Chondrosarcoma with metastasis to lung. This is the first tumor of this type observed in our rhesus breeding colonies containing over 6000 animals.

AFIP Diagnosis. Chondrosarcoma, skin and lung, rhesus monkey, primate.

Conference Note. Cartilagenous neoplasms arise from costochondral junctions, flat bones, epiphyses, and also rarely from the subcutis. The matrix of the lung neoplasm shows weak positivity with saffranin o, and slightly greater positivity with alcian blue, indicative of acid mucopolysaccharide, probably chondroitin sulfate. Skin sections are negative with both stains. Some H&E sections contain condensed pink material, suggestive of osteoid, within the tumor.

The history in this case suggests that this neoplasm arose from the femur. In the experience of the Department of Orthopedic Pathology, an osteosarcoma which breeches the bone cortex can have the histologic appearance of a bone, cartilage, or fibrous connective tissue neoplasm outside of the bone; within the bone, however, it will always look like an osteogenic neoplasm.

Some attendees also noted a granular green to yellow black pigment within the lung, suggestive of mite pigments (possibly Pneumonyssus).

Contributor. National Center for Drugs and Biologics, FDA, 8800 Rockville Pike, Bethesda, Maryland 20205.

Suggested reading.
Cooper, J. E., and Greenwood, A. G.: A chondrosarcoma in an African crested porcupine. Vet. Path. 16: 734-736, 1979.
Gregson, R. L., and Offer, J. M.: Metastasizing chondrosarcoma in laboratory rats. J. Comp. Path. 91: 409-413, 1981.
Halliwell, W. H.: Chondrosarcoma: A light and electron microscopic study of a case in a dog. Am. J. Vet. Res. 38: 1647-1652, 1977.

Case IV - 84-5644 (AFIP 1947594).

History. Tissue from a male Gamebird from a backyard flock, all of which had a history of lameness.

Gross Pathology. Both legs and toes are diffusely covered by a thick layer of scales and crusts. The lungs contain multiple, small, discrete to coalescing pale tan to grey foci.

Contributor's Morphologic Diagnosis. Bronchitis, granulomatous, chronic, diffuse, severe, with intrabronchial mites, lung, avian; etilogy--pulmonary acariasis.

The most likely etiologic agent is Cytodites nudus, the air sac mite of poultry. This mite has been found in air sacs, lungs and bone cavities of many different avian species. There is controversy over the pathological effects of this mite and some believe it to be harmless. In this case and in other reported cases when there is a heavy infestation there are severe pathological changes.

AFIP Diagnoses. 1) Parabronchitis, granulomatous, multifocal, moderate, with intraluminal arthropod parasites, lung, breed unspecified, avian. 2) Granulomas, multifocal, minimal to mild, lung.

Conference Note. Some attendees noted squamous metaplasia of the epithelium of several parabronchi, and a focal necrogranuloma thought to be a foreign body response to a dead mite. Special stains failed to demonstrate any additional infectious agents. Although the mites are well-preserved, a diagnosis of Cytodites sp. could not be made based upon the morphology seen in these histologic sections.

The life cycle of Cytodites has not been fully elucidated. It is thought, however, that mites lay eggs in the lower air passages, the eggs are coughed up, swallowed, and reach the ground in the droppings. The mode of infection is unknown. Some authors feel that the mites are predisposing factors for tuberculosis. Lindt and Kutzer (1965) found C. nudus to cause granulomatous pneumonia which was sometimes fatal. The mites are frequently seen grossly as white nodules on the air sacs.

Other mites of the respiratory system of poultry include Sternostome, Neonyssus and Rhinonyssus although none is an important parasite commercially. Pneumonyssus spp are found in the airways of monkeys and dogs.

Some attendees speculated that the history of lameness in this flock, and gross necropsy findings of thickened scales and crusts on the lower legs was suggestive of infection by the scaly leg mite (Knemidocoptes).

Contributor. State of Alabama, Dept of Agriculture & Industries, Veterinary Diagnostic Laboratory, Auburn, Alabama 36831-2209.

Suggested reading.

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Lindt, S., and Kutzer, E.: Air sac mites as a cause of granulomatous pneumonia in chickens. Path. Vet. 2: 264-276, 1965.

Mathey, W. J.: Respiratory ascariasis due to Sternostome tracheacoluum in the budgerigar. J. Am. Vet. Med. Assoc. 150: 777-780, 1967.

McOrist, S.: Cytodites nudus infestation of chickens. Avian Path. 12: 151-155, 1983.

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Results
AFIP Wednesday Slide Conference - No. 10
28 November 1984

Conference Moderator: Michael R. Elwell, DVM, PhD
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Diplomate, ACVP
Staff Pathologist
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Case I - 73450 (AFIP 1947395).

History. A Holstein cow with no previous history of reproductive problems aborted this 6-month-old fetus. The dam is one of 52 milking cows in a tie-stall barn. The cows were vaccinated against rabies, leptospirosis, IBR, Brucella and BVD.

Gross Pathology. The placenta was markedly edematous. There was marked pale intercotyledonary thickening of half of the placenta plus lipping of thickened cotyledons. Irregular necrotic plaques were present on the amniotic surface. No gross fetal lesions. The placental lesions were suggestive of mycotic or ureaplasma infection.

Laboratory Results.
Bacteriology: Lung - no bacterial growth.
Stomach & placenta: Wet mount negative. Brucella stain negative. Large numbers of alpha Strep. A few nonhemolytic E. coli from placenta.
Mycoplasma: Ureaplasma isolated from lung and placenta.
Serology: Agglutination test for Leptospira pomona and L. hardjo - negative. Brucella abortus rapid test - negative.

Contributor's Diagnoses & Comment. Severe subacute, generalized necrotizing placentitis with marked vasculitis. Mild alveolitis with marked pulmonary lymphoid aggregate formation. Both fetal and placental lesions due to Ureaplasma infection.

The severe placentitis in this case is characterized by necrosis of chorioallantois and amnion, with marked infiltration primarily by mononuclear cells, edema, fibrosis, and marked vasculitis. (Two blocks were cut and the reaction is more severe in one of the sections of chorioallantois). Large numbers of streptococci are present in section without reaction and are likely terminal invaders. E. coli streptococci, Yersinia, and other mycoplasmas are occasionally isolated from cases of Ureaplasma abortion and are of unknown significance. Diffuse alveolitis, septal thickening, and formation of peribronchiolar/perivascular lymphoid aggregates are common findings in both natural and experimental Ureaplasma abortion.

Ureaplasma should be considered as a cause of bovine abortion, especially when placentitis/amnionitis is noted grossly.

AFIP Diagnoses. 1) Placentitis, necrotizing, acute, multifocal, moderate, with segmental vasculitis, thrombosis, and numerous coccobacilli, placenta, Holstein fetus, bovine. 2) Pneumonia, subacute, diffuse, moderate, with peribronchiolar lymphoid hyperplasia, lung.

Conference Note. Discussion centered around the presence of the neutrophils in the bronchioles and alveoli of the fetal lung. Some attendees speculated that 1) the neutrophils were shed from the placenta into the amnionic fluid and that they were then aspirated into the airways, and 2) that the only lesion caused by Ureaplasma was the lymphoid nodules. Lesions caused by Ureaplasma were thought to be solely the lymphoid nodules. Most attendees, however, thought that the neutrophils were part of the alveolitis, which like the lymphoid nodules, were the result of Ureaplasma infection. While there was general agreement that the bacteria in the placenta were largely the result of overgrowth, the finding of some phagocytized bacteria and their concentration in the necrotic foci, suggests a more active role by bacteria in the genesis of placental lesions.

Ureaplasmas are members of the Mycoplasma group. U. urealyticum is frequently isolated from the vaginal flora of women and has been associated with endometritis, infertility, and is suspected to cause low birth weights of infants. Since its first isolation from cattle in 1967, U. diversum has been commonly isolated from vulvar discharges, granular vulvitis, preputial washings and semen of bulls, and from aborted fetuses. A study by Miller, Ruhnke, Doig, et al. in 1983 supports a causal relationship between U. diversum infection and abortion and/or birth of calves with pneumonia. In sheep, ureaplasmas can be transmitted venereally and appear to cause reproductive losses in part, it is thought, by attachment to spermatozoa with resultant loss of motility. Ureaplasma spp. have also been linked with chronic infertility in turkeys.

Contributor. Veterinary Laboratory Services, Ontario Ministry of Agriculture and Food, P.O. Box 3612, Guelph, Ontario N1H 6R8.

Suggested reading.

Ball, H. J.; McCaughey, W. J.; Irwin, D.: Persistence of Ureaplasma genital infection in naturally-infected ewes. Br. Vet. J. 140: 347-353, 1984.

Doig, P. A.: Bovine genital mycoplasmosis. Can. Vet. J. 22: 339-343, 1981.

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Miller, R. B.; Ruhnke, H. L.; Doig, B. J. et al.: The effects of Ureaplasma diversum inoculated into the amniotic cavity in cows. Theriogenology 20: 367-374, 1983.

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Ruhnke, H. L.; Palmer, N. C.; Doig, P. A. et al.: Bovine abortion and neonatal death associated with Ureaplasma diversum. Theriogenology 21: 295-301, 1984.

Stipkovits, L. et al.: The possible role of ureaplasma in a continuous infertility problem in turkeys. Avian Dis. 27: 513-523, 1983.

Case II - H84-1 (AFIP 1946321).

History. The outbreak farm which belongs to Taiwan Sugar Corporation, contains about 1200 sows, 50 boars, 7600 feeder pigs and 3850 suckling pigs. All of the breeding stocks had been vaccinated with attenuated erysipelas vaccine before breeding and had been bred natural service.

The disease first appeared on May 13, 1984 in breeding stock. This outbreak lasted about 3 weeks. A total of 74 sows and 13 boars were affected; among these, 17 sows and 3 boars died.

Symptoms, common to majority of sick animals (breeding age) were anorexia, high fever of 40,5-41.5°C, cyanosis and abortion (4 cases), whereas both the feeder and suckling pigs did not show any signs of the disease. A total of 6 dead animals were submitted for necropsy and laboratory examination. Tissues in this case are from a 3-year-old crossbred sow.

Gross Pathology. The sick animals had purplish red discoloration of the ears, ecchymotic hemorrhage in the skin, and petechial hemorrhages were seen in kidney, heart and serous membranes of visceral organs. Lymph nodes and spleen were enlarged.

Laboratory Results.

a) Blood samples and visceral organ samples were cultured on blood agar for 36 hours. E. rhusiopathiae was identified by growth characteristics and biochemical properties.

b) Four mice were inoculated intraperitoneally with whole blood of the infected pigs collected during the early stage of the disease. All 4 mice died within 36 hours after inoculation and Erysipelothrix was isolated from the visceral organs.

c) Examination of the attenuated E. rhusiopathiae vaccine: The bacteria in the vaccine numbered 20 million per ml, which was much lower than the standard levels at 100 million per ml.

Contributor's Morphologic Diagnosis.

1) Fibrinous microthrombosis or disseminated intravascular coagulation with focal necrosis, acute, diffuse, kidney, porcine.

2) Etiology - Erysipelothrix rhusiopathiae.

Gross, histopathological and bacteriological findings show that the enzootic was caused by E. rhusiopathiae.

E. rhusiopathiae infection is commonly seen in this country. Septicemia and microthrombosis in most body organs are the diagnostic lesions in an acute disease.

The mechanism of pathogenicity of E. rhusiopathiae is not clearly understood, but there is considerable evidence that neuraminidase is involved. This enzyme is produced by all strains of E. rhusiopathiae. It cleaves alphaglycosidic linkages in neuraminic acid, a reactive mucopolysaccharide on the surface of body cells.

The infection was finally controlled by the use of penicillin, double dosages of the attenuated E. rhusiopathiae vaccine and certain management procedures. No new cases of the infection have been seen since June 3, 1984.

AFIP Diagnosis. Thrombosis, fibrinous, acute, diffuse, mild to severe, glomeruli and arterioles, kidney, crossbred, porcine.

Conference Note. Tissue sections vary in severity of the lesions. The phosphotungstic acid hematoxylin (PTAH) stain demonstrated the pink fibrillar material within capillaries and arterioles to be fibrin. Gram stains failed to demonstrate bacteria in any tissues examined. Discussion centered around the possible presence of lesions in the renal tubules. Despite the presence of apparently viable, well-preserved red blood cells in all sections examined, many attendees thought that the graduated loss of basophilic staining of tubular epithelial cell nuclei indicates that the cells are autolytic. Randomly throughout tubules some tubular epithelial cell nuclei are karyorrhectic and karyolytic, indicating there is individual epithelial cell necrosis. In some sections mild interstitital nephritis was noted but was not thought to be due to erysipelas.

Neuraminidase is produced by all strains of E. rhusiopathiae and must be produced in large amounts to be pathogenically active, as would be the case in massive septicemia. It acts in a variety of ways and produces a variety of effects, some of which are increased permeability of cell membranes, formation of excess fibrin and fibrinogen, and stimulation of erythrocyte agglutination leading to hemolysis. These pathological activities can account for most aspects of the early pathogenesis of acute erysipelas (Woods, 1984).

Contributor. Animal Industry Research Institute, Tapu, Chunan, Miaoli, Taiwan 350, R.O.C. 00435.

Suggested reading.

Woods, R. L.: Erysipelas. In Diseases of Swine. 15th Edition, The Iowa State University Press, 1981, pp 457-470.

Woods, R. L.: Swine erysipelas - a review of prevalence and research. J. Am. Vet. Med. Assoc. 184: 944-949, 1984.

Case III - 83PD11523 (AFIP 1949349).

History. The tissue specimen is from the kidney of a 10-month-old feedlot calf. The calf was one of a group of 25 calves which were treated for signs of anorexia and respiratory disease (coughing, dyspnea). This calf did not respond to treatment and died four days after the initiation of therapy. A total of 12 of the 25 calves died and were presented for necropsy with similar lesions.

Gross Pathology. Gross necropsy findings were similar in all calves. Large amounts of a straw-colored fluid containing fibrin clots were found within the peritoneal cavity. Additional lesions included perirenal edema, perirenal hemorrhage, and pale swollen kidneys. Focal abomasitis and diffuse fibrinous bronchopneumonia were found in all calves examined.

Laboratory Results.

Serum urea nitrogen	218 mg/dl
Peritoneal fluid urea nitrogen	191 mg/dl
Serum phosphorus	12.5 mg/dl
Serum total protein	5.3 g/dl
Serum calcium	8.9 mg/dl

Lung specimens:
Pasteurella multocida cultured
IBR, BVD, PI_3 - negative
Liver and kidney specimens:
Negative for toxic amounts of lead, mercury, arsenic.

Contributor's Diagnosis & Comment.
Tubular nephrosis, acute, severe.
Oxytetracycline toxicosis.

After arrival at the feedlot, all calves were given long-acting oxytetracycline (OTC) IM at two times the recommended dose. The next day, this dose was repeated IV in seven calves, followed by IM infections at the recommended dose for four days. The remaining eighteen calves were given the recommended dose IV, followed by the same dose for four days. On day 10, calves began to die, eventually resulting in 48% mortality.

The administration of excessive doses of OTC in these calves may have directly contributed to the resulting renal lesions. Nephrotoxic properties of OTC are attributable in part to the inhibitory effects of the drug on the oxidative enzymes of tubular cells. In addition, tetracyclines have been shown to inhibit the ability of the kidney to concentrate urine. The cardiovascular effects of OTC and various vehicles have been investigated in calves. Intravenous administration of OTC in propylene glycol and propylene glycol alone induces systemic hypotension and decreased pulmonary and renal arterial blood flow. Polyvinyl-pyrrolidone vehicle injected IV in awake calves caused an increase in systemic resistance due to constriction of peripheral arterioles. These vehicles in various forms are used in most injectable OTC products, including those involved in this case report. Many factors other than just the high dosage of the tetracycline may have constributed to the renal lesions in the calves of this report. The calves were given IV boluses of OTC in vehicles with known systemic vascular effects, which may have contributed to reduced renal flood flow. The degree of dehydration could not be accurately assessed, but may have contributed to reduced glomerular filtration and increased urea nitrogen levels. The calves did not have hepatocellular degeneration, as has been reported in man and cattle treated with tetracycline products.

AFIP Diagnosis. Necrosis, tubular, cortical, diffuse, severe, kidney, Charolais cross, bovine.

Conference Note. In addition to the tubular necrosis, attendees also noted 1) diffuse, minimal tubuloepithelial-cell regeneration, 2) mildly congested vessels at the corticomedullary junction, and 3) small scattered interstitial aggregates of leukocytes. It was speculated that lymphocytic aggregates were not related to the tubular lesions since they are a common finding in bovine kidneys. The pink granular material within tubules was thought to be debris from sloughed tubular epithelial cells. The differential diagnosis included toxicosis due to antibiotics, heavy metals, and oak ingestion. It was agreed that these could not be differentiated histologically, but that toxicosis due to the latter two would be unlikely in feedlot animals.

This case report was recently published by the contributor (Larimore et al., 1984), and more details concerning this incident may be found in that paper. The nephrotoxic effects of commonly-used antibiotics have been summarized by Appel and Neu (1977). In man, the production of a nephrogenic diabetes insipidus and reversible Fanconi Syndrome, as well as fatty metamorphosis of hepatocytes, acute pancreatitis, and hematopoietic disorders have been associated with tetracyclines (Fox, Berengi, Straus, 1976).

Contributor. Department of Pathology, College of Veterinary Medicine, Colorado State University, Fort Collins, Colorado 80523.

Suggested reading.

Appel, G. B., and Nev, H. C.: The nephrotoxicity of antimicrobial agents. New Eng. J. Med. 13: 722-728, 1977.

Fox, S. A.; Berengi, M. R., and Straus, B.: Tetracycline toxicity presenting as a multisystem disease. Mt. Sinai J. Med. 43: 129-135, 1976.

Griffin, D. D.; Morter, R. D.; Amstutz, H. E. et al.: Experimental oxytetracycline toxicity in feedlot heifers. Bovine Pract. 14: 37-41, 1979.

Gross, D. R.; Dod, K. T.; Williams, J. D. et al.: Adverse cardiovascular effects of oxytetracycline preparations and vehicles in intact awake calves. Am. J. Vet. Res. 42: 1371-1377, 1981.

Larimore, M.; Alexander, A.; Powers, B. et al.: Oxytetracycline associated nephrotoxicosis in feedlot calves. J. Am. Vet. Med. Assoc. 185: 793-795, 1984.

Stevenson, S.: Oxytetracycline nephrotoxicosis in two dogs. J. Am. Vet. Med. Assoc. 176: 530-531, 1980.

Case IV - 84-3219 (AFIP 1948306).

History. Tissue from one of a litter of nine 1-day-old Land/York female pigs all born alive but with red spots all over their bodies. They appeared to be getting weak and this one died at 1 day of age. They were in farrowing crates in a 230 sow unit.

Gross Pathology. The whole surface of the skin of this piglet was covered with round reddish umbilicated vesicles and pustules. The nose was very severely affected, with the lesions becoming confluent and necrotic with little normal tissue remaining. Similar, though less severe, lesions were present on the tongue from which the submitted section was taken. There were a few flecks of milk in the stomach.

Laboratory Results.

Bacteriology on skin: heavy growth of Staph. aureus and Staph albus.

Virology and EM on tongue: pox virus demonstrated.

Contributor's Diagnosis & Comment. Glossitis, ballooning degeneration of the stratified squamous mucosal cells with eosinophilic intracytoplasmic inclusions. There is acanthosis and secondary bacterial infection. Glossitis - pox virus.

Pox lesions in pigs can be caused by the cowpox virus, the vaccinia virus and the swinepox virus and in this case we were not able to establish which virus was implicated. Pox is well documented in suckling pigs, but we have included this case as the infection was obviously obtained in utero. In this case the piglets were born alive but in two other cases (separate farms) the piglets were stillborn and had extensive pox lesions over the skin, nose and in the mouth. Although these are isolated incidents, pox virus is not usually considered to be an intrauterine infection even though there is on occasion a viremic stage.

The lesions on the slides vary; however, all demonstrate the ballooning degeneration and intracytoplasmic inclusions.

AFIP Diagnosis. Glossitis, ulcerative, acute, focal, moderate to severe, with epithelial ballooning degeneration and eosinophilic intracytoplasmic inclusion bodies, tongue, Landrace/Yorkshire, porcine, etiology--compatible with poxvirus.

Conference Note. The differential diagnosis includes foot and mouth disease, vesicular stomatitis, vesicular exanthema, vegetative dermatitis, skin lesions associated with erysipelas and hog cholera, and others. However, the histological finding of hydropic degeneration of cells in the stratum spinosum, and the presence of intracytoplasmic inclusion bodies are characteristic of poxvirus infections. Furthermore, vacuolation of the infected epithelial cell nuclei is said to be pathognomonic for swine pox, differentiating it from vaccinia virus (Kasza, 1981). Infection with swine pox is thought to interfere with development of titers to hog cholera vaccines.

The papillary structures on the tongue surface were thought by attendees to be marginal papillae which are present on the tongues of suckling animals and function to form a seal between tongue and nipple.

Contributor. British Columbia Veterinary Laboratory, B.C. Ministry of Agriculture & Food, P.O. Box 100, Abbotsford, B.C., Canada V2S 4N8.

Suggested reading.

Kasza, L. et al.: Experimental swine pox. Am. J. Vet. Res. 23: 443-451, 1962.

Kasza, L.: Swinepox. In Diseases of Swine. 5th Ed., Leman, A. D. et al. (Ed.), Iowa State University Press, 1981, p. 254.

Meyer, R. C. and Conroy, J. D.: Experimental swine pox in gnotobiotic piglets. Res. Vet. Sci. 13: 334-338, 1972.

Teppema, J. S. and DeBoer, G. F.: Ultrastructural aspects of experimental swinepox with special reference to inclusion bodies. Arch. Virol. 49: 151-163, 1975.

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Results
AFIP Wednesday Slide Conference - No. 11
5 December 1984

Conference Moderator: Lester W. Schwartz, DVM
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Case I - AC-249-85 (AFIP 1951858).

History. Tissue from a 5-week-old female canary. A number of young canaries from this aviary had died following 3 to 4 day course of diarrhea. Adult birds were reported to have occasional periods of diarrhea but no mortality associated with diarrhea periods.

Gross Pathology. Muscle wasting, inflammation of small intestine pronounced, kidneys slightly pale.

Laboratory Results. Direct smears of intestine by referring practitioner revealed no coccidia.

Contributor's Diagnosis & Comment.
Morphologic Diagnosis: Autolytic change present in all tissues; severe diffuse subacute enteritis; moderate diffuse subacute hepatitis; pulmonary congestion.
Etiologic Diagnosis: Protozoal enteritis and hepatitis.
Etiology: Isospora serini.

The enteritis is characterized by marked infiltration of the lamina propria by macrophages, many of which contain protozoal organisms. Large numbers of similar organisms are also found free in the lamina propria. The liver has a diffuse infiltration of large mononuclear inflammatory cells which is most prominent in triad areas and surrounding foci of hepatic necrosis. In the liver and lung, protozoa are usually within phagocytes but are also free in the parenchyma. No changes were found in the section of ventriculus.

AFIP Diagnoses. 1) Enteritis, histiocytic, diffuse, severe, transmural, with intracellular and extracellular protozoa, small intestine, canary, avian. 2) Pneumonia, interstitial, histiocytic, diffuse, mild, with intrahistiocytic protozoa, lung. 3) Hepatitis, histiocytic, diffuse, mild, with intracellular protozoa, liver. 4) Protozoemia, intracellular, liver and lung.

Conference Note. A similar case in a crested wood partridge was recently received and reviewed by the AFIP. The lung lesions in that case resembled toxoplasmosis due to multifocal areas of necrosis. Also in the small intestine of that case were multiple foci of necrosis and a more severe transmural inflammatory response. Although necrosis is not a feature in this case, the lesions are otherwise similar but mild in comparison. The differential diagnosis in both cases includes Toxoplasma gondii, Isospora spp., and other members of the subphylum Apicomplexa. Differentiation might be possible through close examination of oocysts but they are absent in this case as are all sexual stages.

Box (1981) has suggested that Isospora serini has in the past been called Haemogregarina, avian Toxoplasma, Atoxoplasma, and Lankesterella. Unlike other species of Isospora in passerine birds, I. serini produces a multisystemic chronic and fatal disease.

In this case, the unaffected tissue section was identified by attendees as a thin portion of the gizzard.

Contributor. Animal Disease Diagnostic Laboratory, Purdue University, West Lafayette, Indiana 47907.

Suggested reading.

Box, E. D.: Isospora as an extraintestinal parasite of passerine birds. J. Protozool. 28(2): 244-246, 1981.

Box, E. D.: Life cycles of two Isospora species in the canary, Serinus canarius Linnaeus. J. Protozool. 214: 57-67, 1977.

Box, E. D.: Exogenous stages of Isospora serini (Aragao) and Isospora canaria sp. in the canary (Serinus canarius Linnaeus). J. Protozool. 22: 165-169, 1975.

Petrak, M. L.: Diseases of Cage and Aviary Birds. 2nd Ed., Lea & Febiger, 1982, p. 541.

Case II - 84-P-671 (AFIP 1945658).

History. Tissue from a 4-month male Duroc, porcine. A purebred producer raising SPF breeding stock noted some coughing among pigs housed in an open-front unit on a concrete slab. During the next 2 days, sneezing and coughing by most of the pigs was noted. On the following day, one pig was dead and the others had slightly labored respiration, persistent coughing and were gaunt.

Gross Pathology. The anterior and ventral parts (about 70%) of both lungs were purple, firm and failed to collapse. Interlobular septa were widened. There was approximately 40 cc of clear, yellow thoracic fluid. The tracheal mucosa was diffusely reddened, rough and had multiple tan foci on the surface. Serosanguinous fluid exuded from the cut surface of the lung and white, tenacious material was present in smaller airways. Tracheobronchial lymph nodes were swollen, edematous and hemorrhagic. The meninges were congested.

Laboratory Results. The fluorescent antibody test on tonsil was positive for pseudorabies viral antigen. Pseudorabies virus was isolated from brain and lung. Bacteriologic culture yielded a mixed population of beta hemolytic Streptococcus, Pseudomonas and Proteus spp. Streptococcus equisimilis was the predominant lung organism. Cultures for Hemophilus sp. were negative.

Contributor's Diagnosis & Comment. Severe acute diffuse necrotizing bronchitis, bronchiolitis and alveolitis with serofibrinous pneumonia and eosinophilic intranuclear inclusion bodies. Pseudorabies virus.

Microscopic lesions were also found in sections of brain (mild acute focal nonsuppurative encephalitis) and tonsil, spleen and liver (focal necrosis). The bacteria isolated were considered to be opportunists or contaminants. Outbreaks of severe disease and some deaths in larger fattening hogs (75-100 kg) and near-breeding age pigs, in which PRV is the primary pathogen, appear to be increasing in the midwest.

AFIP Diagnosis. Bronchopneumonia, fibrinonecrotic, suppurative, multifocal to diffuse, severe, with eosinophilic intranuclear inclusion bodies, lung, Duroc, porcine, etiology--compatible with Herpes suis (pseudorabies).

Conference Note. Conference attendees noted the necrosis to be primarily involving the airway epithelium; similarly, intranuclear inclusions are seen primarily in airway epithelial cells, and occasionally in alveolar pneumocytes, and endothelial cells of blood vessels and lymphatics. Alveolar septa are thickened due to congestion and fibrin deposition. The presence of fibrin can be expected in infections with pantropic viruses (herpes in this case) which can cause endothelial damage and leakage of plasma proteins (fibrinogen included) from affected vessels. Although lung lesions due to Hemophilus would be very similar to those seen in this case, it can be ruled out as the primary etiology due to the presence of inclusion bodies and the negative Hemophilus culture. Some attendees commented that there would probably be more vasculitis seen with Hemophilus infection.

The moderator cited that after experimental damage to alveolar pneumocytes (species unknown), type II pneumocyte proliferation is not seen before 24-36 hours. Although regeneration after damage by a natural agent (virus, etc.) may take slightly longer, lack of regeneration in this case suggests that the lung has been involved for less than 24 hours.

Two forms of pseudorabies are recongized: a purely CNS disease, which is the more common form, and a combined respiratory and CNS form with nervous signs following the onset of respiratory disease by 2-3 days. Affinity for the respiratory tract might vary from outbreak to outbreak due to the differences in the various infecting strains of the virus (Baskerville, McFerran, Dow, 1973). Reactivation of latent pseudorabies virus is thought to be important in disease transmission to susceptible pigs; as with herpesvirus infection in other species, the trigeminal ganglion is thought to be a site of the latent virus. It has been suggested that tonsils and lymph nodes may also harbor the latent virus in pigs (Van Oirschot, Gielkens, 1984).

Contributor. Department of Veterinary Pathology, Iowa State University, Ames, Iowa 50011.

Suggested reading.

Baskerville, A. et al.: Aujeszky's disease in pigs. Vet. Bull. 43: 465-480, 1973.

Donald, A. I.; Martin, S.; Ferris, N. P.: Experimental Aujeszky's disease in pigs: Excretion, survival and transmission of the virus. Vet. Rec. 113: 490-494, 1983.

Gustafson, D. P.: Pseudorabies. In Diseases of Swine. 5th Ed., Leman, A.D. et al. (Eds.), Iowa State Univ. Press, 1981, p. 209.

Narita, M.; Inui, S.; Shimizu, Y.: Tonsilar changes in pigs given pseudorabies (Aujeszky's disease) virus. Am. J. Vet. Res. 45: 247-251, 1984.

Van Oirschot, and Gielkens, A.L.J.: In vivo and invitro reactivation of latent pseudorabies virus in pigs born to vaccinated sows. Am. J. Vet. Res. 45: 467-471, 1984.

Case III - 408U (AFIP 1902460).

History. Tissue from a 12.9-year-old purebred female beagle. At about 12 years of age, a disease condition was diagnosed based on clinical signs of persistent bilaterally symmetrical alopecia, abdominal distention and weight loss of 7 months duration and on ACTH stimulation and dexamethesone suppression tests. Pulmonary function testing, thoracic radiographs and lung imaging studies indicated that a pulmonary embolus was present and that dynamic lung compliance was reduced nearly 50%. Calcified foci in the alveolar parenchyma were noted on radiographs. Lysodren (O,P'-DDD) therapy was begun to control the hypercortisolism. A repeat ACTH response test--three months later showed a return to normal values. Pulmonary function tests, however, indicated a progression of abnormalities, with gas exchange being markedly impaired. The arterial-alveolar PCO_2 difference and the percent alveolar deadspace ventilation were increased indicating ventilation of unperfused alveoli. A second series of pulmonary function tests three months later showed further deterioration of pulmonary function. One month later, the dog developed dyspnea with a respiratory rate of 116 per minute. She was euthanized in respiratory failure.

Gross Pathology. The lungs did not collapse when the thorax was opened. They were heavier than normal (187 gm vs. 80 gm for this size beagle), although no edema was present. The pleural surfaces were irregularly mottled with pale yellow areas that, on cut surface, had a somewhat dry appearance and gritty consistency. No thrombi were seen in the pulmonary arteries.

Laboratory Results. No abnormalities were seen in serum Ca and P levels or in ratios.

Contributor's Diagnosis & Comment.

Lung - alveolar septal fibrosis.
Lung - alveolar septal calcification with microlith formation.
Pulmonary arteries, elastic - subintimal edema.
Pulmonary arteries, muscular - acute segmental vasculitis.

This dog presented with typical clinical signs (bilaterally symmetrical alopecia, generalized muscle atrophy and abdominal distention) and initial laboratory abnormalities (eosinopenia, lymphopenia, elevated SAP and urine of low specific gravity) associated with the overproduction of endogenous glucocorticoids.

Radiographic evidence of soft tissue mineralization in the respiratory system has been reported in dogs with Cushing's diseases. The radiographic changes described in this report are of interest from the standpoint of the progression of lung alterations which, over the period of 19 months, became increasingly more severe and mineralized in spite of therapy with O,P'-DDD. Some of the increase in lung density can be attributed to changes which occur in the lungs of aged dogs. However, the severity and extent of involvement suggest that this endocrinopathy was the major contributing factor of these radiographic changes.

Thromboembolic complications are a recognized sequella in human patients with Cushing's disease and have been documented several times in dogs with Cushing's-like disease. It has been suggested that the hypercortisolism may cause a hypercoagulable state by increasing coagulation factors V, VIII, IX, X, antithrombin III, fibrinogen and plasminogen, which could lead to the increased incidence of thromboembolism. Although clotting factor studies were not performed

on this patient, the ventilation-perfusion scan showed the presence of a perfusion defect in the right apical lung lobe, suggesting the presence of pulmonary thromboembolism.

This case demonstrated some histologic lung changes normally found in aged dogs, but a number of processes were also present that are found in some dogs with Cushing's-like disease. Calcified alveolar microliths have been reported and their distribution and morphologic features were similar to the previous report. The mechanism of mineralization has not been identified, but elevated steroid levels may alter proteins such as collagen and elastin by rearranging their molecular structure in such a way as to produce a calcifiable matrix. Additionally, treatment with O,P'-DDD would suppress glucocorticoid levels and thereby allow fibrosis, which would normally be inhibited by hypercortisolism, to proceed.

The vascular lesions present in this case appeared to be of recent origin and it is unlikely that they were present at the time of ventilation-perfusion lung scanning. The cause of these lesions is unknown but may be related to the interstitial pneumonia found at necropsy.

The presence of a chromophobe adenoma in the anterior pituitary in addition to the response to ACTH and dexamethasone administration support the diagnosis of pituitary-dependent hyperadrenocorticism.

Regions of fibrosis and mineralization involving the kidneys seem to suggest an etiology similar to that for the lung microliths because of the lack of renal secondary hyperparathyroidism and normal calcium levels, although dystrophic calcification cannot be ruled out as a possible cause.

AFIP Diagnosis. Microlithiasis, interstitial and alveolar, multifocal, moderate with fibrosis and multifocal osseous metaplasia, lung, beagle, canine.

Conference Note. The focal mineral deposits seen in this case were not considered typical of mineralization seen with uremia or vitamin D toxicity. Some attendees did, however, note mineralization of blood vessels and small bronchioles. As mentioned by the contributor, pulmonary calcification has been reported in dogs with Cushing's disease. In a study of 57 cases, Lorenz (1982) found calcification in the lungs of 4 dogs. Interestingly, 3 of those 4 dogs had been treated with O,P'-DDD. The intimal myxomatous change seen in some vessels in this case, was thought by most attendees to be edema. A few, however, thought it represented the intimal cushion normally present at vessel bifurcations.

Contributor. Lovelace Inhalation Toxicology Research Institute, P.O. Box 5890, Albuquerque, New Mexico 87185.

Suggested reading.

Burns, M. G.; Kelly, A. B.; Hornof, W. J. et al.: Pulmonary artery thrombosis in three dogs with hyperadrenocorticism. J. Am. Vet. Med. Assoc. 178: 388-393, 1981.

Feldman, H. C.: Distinguishing dogs with functioning adrenocortical tumors from dogs with pituitary-dependent hyperadrenocorticism. J. Am. Vet. Med. Assoc. 183: 195-200, 1983.

Lorenz, M. D.: Diagnosis and medical management of canine Cushing's syndrome: A study of 57 consecutive cases. J. Am. Anim. Hosp. Assoc. 18: 707-716, 1982.

Schechter, R. D.; Stabenfeldt, G. H.; Gribble, D. H. et al.: Treatment of Cushing's syndrome in the dog with an adrenocorticolytic agent (OP'-DDD). J. Am. Vet. Med. Assoc. 162: 629-639, 1973.

Case IV - R-1484-81 (AFIP 1946346). (2 kodachrome slides).

History. Tissue from a 20-month-old Sprague-Dawley female rat found dead with a 1 cm in diameter ulcer of the caudal abdominal skin.

Gross Pathology. Excessive clear fluid was present in both the peritoneal and thoracic cavities. The liver was enlarged and contained numerous whitish-yellow areas randomly distributed throughout all lobes. The lung contained similar appearing discrete nodules in all lobes.

Contributor's Diagnosis. Histiocytic sarcoma of liver and lung.

AFIP Diagnosis. Histiocytic sarcoma, liver and lung, Sprague-Dawley rat, rodent.

Conference Note. In addition to histiocytic sarcoma, reported by Squire et al. in 1981, conference attendees considered malignant fibrous histiocytoma, and various agents which might incite formation of necrogranulomas (mycobacteria, etc.) in the differential diagnosis. Presence of some atypical mitotic figures and a degree of cellular atypia persuaded most attendees that the mass was a neoplasm. The angiocentricity of the neoplasm in the lung and presence of multinucleated giant cells in lung and liver are features described by Squire. The pattern of this neoplasm is more typical of the granulomatous pattern described by Squire in contrast to the sarcomatous pattern also seen in these neoplasms of Sprague-Dawley rats.

The conference moderator, who also contributed this case, said that of the 6-10 histiocytic sarcomas he has seen in the past year, this case most resembles an inflammatory process, due to the predominance of macrophages and giant cells. He is in agreement with Ward (1981) who thinks that these neoplasms predominate in the skin, in contrast to Squire who finds liver and lung to be the organs most commonly involved. Squire reports an incidence of up to 7.5% in male Sprague-Dawley rats; in the moderator's experience, the incidence is as high as 12% in male rats.

Greaves, Martin, and Masson (1982) report that histiocytic sarcoma (malignant histiocytoma) is part of a distinct group of histiocytic neoplasms of the rat. Tumors of this group range from pure populations of spindle cells which have many ultrastructural characteristics of fibroblasts, to almost pure populations of round histiocytic cells with frequent, well-differentiated multinucleated giant cells. This group, they feel, bears remarkable similarities to malignant histiocytomas in man.

Histiocytic sarcomas are spontaneous tumors of Sprague-Dawley rats, and have also been reported in Osborn-Mendel rats. They can be induced by subcutaneous instillation of "Superglue". A similar tumor has been reported to arise spontaneously from the ovaries of mice (Talmadge, Hart, 1983).

Contributor. Department of Pathology, Smith Kline & French Laboratories, 1500 Spring Garden Street, Philadelphia, Pennsylvania 19101.

Suggested reading.

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Greaves, P., and Faccini, J. M.: Fibrous histiocytic neoplasms spontaneously arising in rats. Br. J. Cancer 43: 402-411, 1981.

Greaves, P.; Martin, J. M.; Masson, M. T.: Spontaneous rat malignant tumors of fibrohistiocytic origin: An ultrastructural study. Vet. Path. 19: 497-505, 1982.

Squire, R. A.; Brinkhous, K. M.; Peiper, S. C. et al.: Histiocytic sarcoma with a granuloma-like component occurring in a large colony of Spraque-Dawley rats. Am. J. Path. 105: 21-30, 1981.

Talmadge, J. E. and Hart I. R.: Morphologic studies on a murine reticulum cell sarcoma (histiocytic sarcoma) of histiocytic origin and its metastases. Vet. Path. 20: 342-352, 1983.

Ward, J. M. et al.: Malignant fibrous histiocytoma: An unusual neoplasm of soft-tissue origin in the rat that is different from the human counterpart. Arch. Path. Lab. Med. 105: 313-316, 1981.

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Results
AFIP Wednesday Slide Conference - No. 12
12 December 1984

Conference Moderator: Linda C. Cork, DVM, PhD
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Case I - 84-874 (AFIP 1944302).

History. Tissue from a 10-day-old female Holstein. At parturition, the calf was in a posterior-longitudinal presentation and was pulled with excessive force. The calf was never able to use its rear limbs. There was no anal or tail tone and there was urinary incontinence. There was no improvement with symptomatic therapy and the calf was euthanatized.

Gross Pathology. The calf was thin with reduced muscle mass in the hind quarters. No skeletal abnormalities were found. Cerebrospinal fluid appeared increased in amount over the lumbo-sacral cord and nerve roots in this area were edematous. The spinal cord was sectioned after fixation. Tan discoloration limited to the grey matter was present in the lumbar cord. The lesion was bilateral except in the anterior lumbar cord in which it was present on the right side. No lesions were detected in the thoracic cord.

Contributor's Diagnosis & Comment. Subacute poliomyelomalacia due to trauma. Malacic areas in spinal cords appearing infarcted have been reported in animals following trauma but without demonstrable vertebral damage or cord compression. Vascular injury is probably a major contributor to spinal cord necrosis due to trauma. Vascular emboli were not found.

AFIP Diagnosis. Infarct, diffuse, severe, with mild multifocal hemorrhage and moderate peripheral histiocytic inflammation, gray matter, spinal cord, Holstein, bovine, etiology--compatible with infarction.

Conference Note. The lesions noted in this case were bilateral diffuse malacia of the gray matter and swelling of many of the ventral rootlets. Asymmetry was noted in the lesions in some sections. The demarcation of the affected gray matter from the adjacent unaffected white matter is striking and is suggestive of a vascular etiology. A review of the arterial vasculature of the spinal cord (De LaHunta, 1983) reveals that the gray matter of the cord is nourished almost exclusively by the central branch of the ventral (anterior) spinal artery, which courses inside the spinal canal. Disruption of the blood flow in the ventral spinal artery could produce the lesions seen in this case and spare the white matter because of the collateral circulation from the ventral radicular artery. Lesions resulting directly from trauma would involve both the gray and white matter. In dogs with cartilaginous emboli, or emboli resulting from mineralized atheromatous plaques as seen in diabetes mellitus, the lesions are more patchy than those present in this case.

Doctor Cork stated that the age of the lesions seen in this case would be a minimum of four days. In the first two days after initial insult, all that may be seen is a change in the tinctorial quality of the tissues. It generally, however, takes a minimum of four days for macrophages (gitter cells) to appear in the lesion, as in this case.

Examination of spinal cord sections cranial and caudal to the site of this injury would show lesions to be most severe ventrally in caudal sections, and dorsally in cranial sections. The swelling of the ventral rootlets suggests disruption of anterograde axoplasmic flow with continued retrograde flow; this results in subsequent accumulation of organelles.

It is possible that forceful extraction of this calf caused subluxation or fracture of the spinal column which then compressed spinal blood flow. Forceful extraction can also result in avulsion of arteries entering the cord with the spinal roots. Injury to the spinal column may be subtle and not be apparent at necropsy.

Mineralization of the nervous tissue, as is seen in some sections in this case, can occur several hours after injury. Some participants also noted mineralization in the walls of small blood vessels.

Contributor. Department of Veterinary Pathobiology, College of Veterinary Medicine, Ohio State University, 1925 Coffey Road, Columbus, Ohio 43210.

Suggested reading.

Balentine, J. D.: Pathology of experimental spinal cord trauma. I. The necrotic lesion as a function of vascular injury. Lab. Invest. 39: 236-253, 1978.

De LaHunta, A.: Veterinary Neuroanatomy and Clinical Neurology. 2nd Ed., Saunders & Co., 1983, p. 206.

Griffiths, I. R.: Spinal cord injuries: A pathological study of naturally occurring lesions in the dog and cat. J. Comp. Path. 88: 303-315, 1978.

Case II - 84-P-724 (AFIP 1945671).

History. Tissue from a 4-year-old Suffolk ewe. The ewe was treated for external parasites three months ago but continued to rub. She was presented with loss of wool around the tailhead, hyperesthesia, mild hypermetria and some difficulty in prehension and swallowing. The ewe was euthanatized. The brain was removed and promptly immersed in formalin.

Gross Pathology. The denuded skin around the tailhead was thickened and leathery. Fibrous adhesions were present between the right lung and rib cage.

Contributor's Diagnosis & Comment. Severe chronic diffuse spongiform encephalopathy. Ovine scrapie.

Sections of medulla or mesencephalon are provided. Lesions are well developed in this case. The size and frequency of neuronal cytoplasmic vacuoles in the medulla are greater than that seen in most cases of ovine scrapie. Some vacuoles contain wisps or globules of eosinophilic material but most are empty. Other

degenerative changes include angular, shrunken and pyknotic neurons. Reactive astrocytes are identifiable as part of the diffuse glial response. Note that microcavitation of the neuropil (status spongiosus) is more pronounced in some gray areas than others. Occasional mononuclear cells occur in Virchow-Robin spaces but typical inflammatory changes are absent. Scrapie is a reportable disease. USDA-APHIS conducts the eradication program. In FY 1984, 32 positive sheep on 19 farms were found. Scrapie is caused by a transmissible, filterable agent and has been called an atypical virus, viroid or prion. Infectivity is associated with a low molecular weight protein (ca 26,000) and the agent may be devoid of nucleic acid. By EM, scrapie-associated fibrils (SAF) occur as 2 short filaments, 4-6 nm in diameter that are wound around each other. One hypothesis proposes SAF to be the etiologic agent.

AFIP Diagnoses. 1) Degeneration and vacuolation, neuronal, diffuse, moderate, brainstem, Suffolk, ovine. 2) Spongiform change, diffuse, mild to moderate, with mild astrocytosis and occasional satellitosis, brainstem, etiology--compatible with ovine scrapie.

Conference Note. The neuronal vacuolation and degeneration and the spongiform change of the neuropil in this Suffolk ewe are quite marked for ovine scrapie. In contrast, these changes in other breeds are often very subtle and the moderator stressed the need in many suspected scrapie cases to compare areas of the CNS with similar anatomical areas in age-matched controls. The inferior colliculus, ventral thalamic nuclei, and medulla should always be examined. And, since dark shrunken neurons with pyknotic nuclei ("dark neurons") can be seen histologically in normal brains, similar neurons in scrapie-affected brains should be compared to normal controls. Neurons which are degenerated as a result of a pathogenic agent will almost always be accompanied by an astrocytic response in that area. Astrocytosis, like spongiform change of the neuropil and neuronal vacuolation, is a characteristic finding in ovine scrapie.

The incubation period of the scrapie agent presents difficulties in control of the disease. The age of onset in more than 75% of affected animals is over 1-2 years; some animals, however live up to six years before clinical signs are seen. Such animals could be asymptomatically incubating and shedding the agent many years after an outbreak.

The nature of the causative agent is not yet known. A twisted particle which forms into beta-pleated sheets (amyloid) has been associated with infectivity. It is possible, however, that the true agent, if it is not the twisted particle, is merely entrapped in the amyloid sheet. The agent is known to be very hydrophobic, making it extremely resistant to disinfection and to environmental factors (freezing, desication, etc.).

Ovine scrapie is histologically indistinguishable from Kuru and Creutzfeldt-Jakob disease in man and from mink encephalopathy. The agent of the latter is not infective for mice but is infective for sheep suggesting the disease is a natural disease of sheep and that mink (and other species) are dead-end hosts.

Contributor. Department of Veterinary Pathology, Iowa State University, Ames, Iowa 50011.

Suggested reading.

Baringer, J.R. et al.: Replication of the scrapie agent in hamster brain precedes neuronal vacuolation. J. Neuropath. Exp. Neurol. 42: 539-547, 1983.

Diringer, H. et al.: Scrapie infectivity, fibrils and low molecular weight protein. Nature 306: 425-426, 1983.

Ehlers, B.; Rudolph, R.; Diringer, H.: The reticuloendothelial system in scrapie pathogenesis. J. Gen. Virol. 65: 423-428, 1984.

Hadlow, W.J. et al.: Virologic and neurohistologic findings in dairy goats affected with natural scrapie. Vet. Path. 17: 187-199, 1980.

Mackenzie, A.: Intraneuronal enzymic inclusions in the histological diagnosis of scrapie. J. Comp. Path. 94: 9-24, 405-415, 1984.

Merz, P.A. et al.: Infection-specific particle from unconventional slow virus diseases. Sci. 225: 437-440, 1984.

Prusiner, S.B. et al.: Scrapie prions aggregate to form amyloid-like birefringent rods. Cell 35: 57-62, 349-358, 1983.

Zlotnik, I.: The histopathology of the brain stem of sheep affected with natural scrapie. J. Comp. Path. & Therap. 68: 148-166, 1958.

Case III - 83-287 A&B (2 slides) (AFIP 1948533). (2 kodachrome slides).

History. Tissues from a 2-year-old female Scottish terrier canine. The dog was fine one night, then found comatose the next morning. Another Scottie was kept in the same fenced yard with this dog and was unaffected. The unconscious dog was taken to an emergency clinic where they identified nystagmus, anisocoria and a rectal temperature of 94° F. Treatment consisted of amoxicillin, mannitol and intravenous fluids. Over the next 12 hours the rectal temperature gradually rose to 100° F., the dog remained unconscious, "paddled" and vomited. The vomitus contained pieces of a plastic bag (used to wrap "thick slice bacon") that was coated with blackened-bacon-fat and what appeared to be mold. The vomitus had a sickening sweet odor like butyric acid. No analyses or samples were saved from the vomitus or plastic wrap. It was two days before the dog could recognize and react to its owner. The dog improved slowly over the next 6 weeks, to the point where it could walk with assistance and respond to external stimuli. Improvement stopped, however, and at this time the dog was tetraparetic, worse on the left side and had some cervical hyperesthesia. The dog was killed and necropsied approximately 60 days from the initial "episode".

Gross Pathology. The animal is an intact female black Scottish terrier in good body condition. Both kidneys contain a few 2-4 mm chronic infarcts confined to the cortices. The spleen contains a single, capsular siderotic plaque with an omental adhesion. Bilaterally symmetrical cavitations are in the caudate nuclei and cingulate gyri (necrosis, malacia).

Laboratory Results. Serum lead and cholinesterase concentrations were determined at the time of the initial problem and were within normal reference range for the laboratory performing the analyses. At the same time liver enzymes (serum alanine aminotransferase and alkaline phosphatase) were moderately increased. Near the time of necropsy no abnormalities were detected in a myelogram, CBC, clinical chemistry panel, and CSF analysis.

Contributor's Diagnosis & Comment. Brain, caudate nucleus, cingulate gyrus - cavitation, necrosis, neovascularization, locally extensive and severe.
Brain, cerebellum -
a) depletion of Purkinje cells, multifocal, moderate to severe
b) depletion (thinning) of granular cell layer, moderate
c) multifocal necrosis of external granular cells
d) status spongiosus of white matter
Brain, vestibular nucleus - vacuolar degeneration, bilaterally symmetrical; etiology--unknown.

The central nervous system lesions in this dog are comparable to what is described by Montgomery and Storts, as well as others in Kerry blue terriers. Doctor Storts examined kodachromes of the gross lesions and microscopic sections from the brain of this dog and felt the morphologic lesions were similar if not identical to what he and Montgomery reported. These authors discuss possible mechanisms that may involve altered neurotransmitter systems in the cerebellar cortex and caudate nucleus.

Cerebellar degeneration (abiotrophy) is not a recognized problem in the Scottish terrier breed. This dog had no clinical signs referrable to the CNS system, or specifically to a "cerebellar ataxia", prior to finding the dog comatose. Furthermore, the dog was from a litter of five, and all pups, as well as the sire and dam and all prior progeny have no known problems referrable to the CNS. The possibilities of a hereditary or viral etiology seem unlikely. We suspect the brain lesions started at the time of the initial incident, steadily progressed and that some toxin may be the primary cause. We are unaware of any toxin that has produced comparable lesions. The dog may also have had two separate problems, one the "toxic-incident" that eventually lead to her death, and secondly a cerebellar abiotrophy that was never detected clinically.

AFIP Diagnoses. 1) Cavitation, multifocal, mild, gray matter, cerebrum, Scottish terrier, canine. 2) Neuronal cell loss and degeneration, segmental, moderate to severe, Purkinje, Golgi, and granular cells, cerebellum; etiology--compatible with a severe hypoxic episode. 3) Neuronal cell loss, diffuse, mild, brainstem.

Conference Note. Participants discussed the lesions seen in the histological sections, their possible interrelation, and possible etiology/etiologies. The cavitation in the cingulate gyrus resembles an old infarct. In the moderator's experience, such a cavitation in the depth of a sulcus is suggestive of decreased perfusion. A thin rim of subpial neural tissue will be spared in many mild cases of ischemia because of perfusion of some nutrients and oxygen into that area from the CSF. Numerous viable endothelial cells in and around the cavitation reflects their resistance to such insults compared to surrounding neural tissue.

The slit-like cavitation and degeneration of the caudate nucleus (seen to be bilateral in gross photos) is surrounded by numerous intensely-eosinophilic elongate tapering bodies or "spikes" which represent astrocytic processes called Rosenthal fibers. These signify an intense astrocytic reaction. In this case, bilateral cavitation of the striatum is once again suggestive of an infarct, possibly due to thrombosis, or to arteriovenous malformation.

In the vestibular nuclei there are diminished numbers of neurons accompanied by astrocytic gliosis. Marked Purkinje and granular cell loss is present, especially near the tips of some folia, while other folia appear normal. In the contributor's experience, these histological findings are suggestive of partial cerebellar herniation. Also, cerebellar herniation would increase pressure on the vestibular nuclei causing neuronal degeneration and eventual loss.

Since all of the histologic lesions appear to be of essentially the same duration, they are probably the result of the same process. In the moderator's opinion they are due to a single hypoxic episode. The areas of the brain most sensitive to hypoxia are fed by the anterior cerebral artery and include the hippocampus, striatum, and Purkinje cells especially at foliar tips. Lesions in the latter two areas are evident in this case but the hippocampus cannot be evaluated.

Initial treatment of this animal with mannitol indicates the clinician(s) thought it had cerebral edema. Cerebral edema causes increased intracranial pressure, which when severe, causes tentorial herniation (hypothermia, uneven pupils) and eventually cerebellar herniation.

The cause of the proposed severe hypoxic episode can only be speculated. Some participants suggested gastric dilitation or choke (plastic in the "vomitus") as possible causes. There is also a possibility that the putative hypoxia was related to an unknown toxin as suggested by the contributor.

Contributor. Department of Microbiology, Pathology & Parasitology, School of Veterinary Medicine, North Carolina State University, Raleigh, North Carolina 27606.

Suggested reading.

Montgomery, D.L., and Storts, R.W.: Hereditary striatonigral and cerebello-olivary degeneration of the Kerry blue terrier. Vet. Path. 20: 143-159, 1983.

Morris, J.H., and Schoene, W.C.: The nervous system. Chapter 29. In Pathologic Basis of Disease. 3rd Ed., Robbins, S.L., Cotran, R.S., Kumin, V. (Eds), W.B. Saunders, 1984, p. 1370.

Oliver, J.E., Jr. and Greene, C.E.: Diseases of the brain. Chapter 34. In Textbook of Veterinary Internal Medicine; Diseases of the Dog & Cat. 2nd Ed., Ettinger, S.J. (Ed.), W.B. Saunders Co., 1983, p. 460.

Case IV - A83-305 (AFIP 1901526).

History. Tissue from a 7-year-old spayed female Chocolate Point Siamese cat. A slowly progressive illness over a 2-week-period was characterized by lethargy and decreased appetite. Physical examination disclosed clear bubbly nasal fluid, coughing, weakness, ataxia, and a slight head tilt to the right.

Neurological examination revealed decreased proprioception in all limbs with greatest loss in the left forelimb. Both optic and tactile placing reflexes were slower in the left than the right forelimb. Hopping reflex was diminished more in the fore than in the hind limbs, and the left forelimb again had the greatest diminished reflex.

There was no improvement after the administration of 1 gram/kg of mannitol I.V. The cat was euthanatized at owner's request.

Laboratory Results. Skull and thoracic radiographs were interpreted as normal.

WBC	10,200
segs	89%
lymphs	7
monocytes	4
PCV	37

Proteinuria	4+
Hyperamylacemia	3,027 units

Spinal fluid analysis

WBC	19
RBC	22,176
protein	87 mg.%

pressure - not recorded

Contributor's Diagnosis & Comment. Malignant ependymoma, cerebrum, Siamese cat, with metastases to ethmoid turbinates, right mandibular and both retropharyngeal nodes, (sections of the cerebral tumor and a retropharyngeal node have been stained with HE).

This is the first primary brain tumor of cats in the files of Angell Memorial Animal Hospital with nodal metastases. The neoplasm involved the anterior right cerebral hemisphere more than the left. Its dimensions were 3.8 x 1.5 x 1.4 cm. It extended from above the optic chiasm adjacent to the third ventricle forward causing compression of the lateral ventricles and elevation of the corpus callosum. It replaced much of the frontal and olfactory lobes and both olfactory bulbs. Both ethmoid turbinates contained neoplastic thrombi. It caused focal lysis and lateral displacement of the orbital process of the right frontal bone. Metastases were found in the right mandibular and both retropharyngeal nodes. Ependymal rosettes with demonstrable blepharoplasts by PTAH and Bielschowsky silver technics were the essential diagnostic features in both the primary and metastatic tumors.

Interstitial nephritis with sclerotic glomeruli was responsible for the proteinuria. No pancreatic lesions were found to explain an elevated serum amylase in the absence of azotemia.

AFIP Diagnosis. Ependymoblastoma, cerebrum, Siamese, feline.

Conference Note. The discussion first centered around whether this neoplasm is primary or metastatic. Metastatic neoplasms of the cerebral cortex first appear as ball-like masses generally in the gray matter bordering on white matter. They then infiltrate out into the surrounding parenchyma. In this case, that pattern is not seen and for that reason participants thought the neoplasm to be primary to the brain. A neoplasm of more fibrillar character would be expected in neoplasms of oligidendroglial or astrocytic origin, due to their extensive processes. Participants did not find this tumor to be especially fibrillar in nature. The presence of many small neoplastic cells with hyperchromatic nuclei is reminiscent of germ cells and suggests a primitive-cell origin. In many areas, however, neoplastic cells do show definite differentiation; cells line up to form whorls and rosettes around empty lumina and some pseudorosettes are formed around vessels, or more commonly, around pink fibrillar neuritic processes (Homer-Wright rosettes). Special stains suggest the presence of blepharoplasts (basal bodies) in some cells although cilia are not present. These findings are indicative of ependymal differentiation and since differentiation towards neural elements is not seen, participants thought this neoplasm most closely fits an ependymoblastoma.

The Dept. of Neuropathology thinks this is a primary neuroectodermal tumor differentiating along neuroblastic pathways. In their experience, neoplasms arising from ependymal cells break into the ventricles and are seeded throughout the brain. They prefer a diagnosis of neuroblastoma or primitive neuroectodermal tumor.

As a differential diagnosis, choroid plexus papillomas are usually more intimately associated with the ventricular system, and the cells are usually cuboidal, as opposed to the tall columnar cells seen in this case. Ependymomas and ependymoblastomas can develop some stroma but a variety of special stains is needed to differentiate tumor-produced stroma from preexisting stroma. It was not possible to determine the origin of the pink fibrillar material seen between nests of tumor cells in this case.

Contributor. Angell Memorial Animal Hospital, 350 S. Huntington Ave., Boston, Massachusetts 02130.

Suggested reading.

Nettles, F.F., and Vandevelde, M.: Thalamic ependymoma in a white-tailed deer. Vet. Path. 15: 133-135, 1978.

Rubenstein, L.J.: Tumors of the central nervous system. Atlas of Tumor Pathology. Second series. American Cancer Soc. and Armed Forces Institute of Pathology, 1972.

Saunders, G.K.: Ependymoblastoma in a dairy calf. Vet. Path. 21: 528-529, 1983.

Zackary, J.F.; O'Brien, D.P., and Ely, R.W.: Intramedullary spinal ependymoma in a dog. Vet. Path. 18: 697-700, 1981.

Zaki, F.A., and Hurvitz, A.I.: Spontaneous neoplasms of the central nervous system of the cat. J. Sm. Anim. Pract. 17: 773-782, 1976.

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Results
AFIP Wednesday Slide Conference - No. 13
19 December 1984

Conference Moderator: Robert M. Kovatch, D.V.M.
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Case I - 8281,8283,8297,8336 or 8354 (AFIP 1947713). (1 kodachrome slide).

History. 2-year-old male Sprague-Dawley rat. Tissues were collected from rats that had been on a chronic oral toxicity study for 2 years.

Gross Pathology. Dental malocclusion and/or dental fractures were found frequently in treated animals. The surfaces of the incisors were white, thickened or pitted. Frequently, the nasal, maxillary, frontal or parietal bones of treated rats were white, thickened, and rough, compared to those of the control animals. These changes were bilaterally symmetrical and were quite obvious on the periosteal surfaces of the bones forming the roof of the cranial vault (photo).

Contributor's Diagnoses & Comment. Ameloblastic dysplasia, diffuse, severe, incisors, with enamel hypoplasia, and incisural malformation, incisor, Sprague-Dawley rat, rodentia. Subperiosteal hyperostoses, diffuse, mild to moderate (depending on section), cranial bones, Sprague-Dawley rat, rodentia. Calcium fluoride granules, moderate, diffuse, bones and teeth, Sprague-Dawley rat, rodentia. Inflammation, nonsuppurative, chronic, multifocal, with keratinized cyst (some sections only), nasolacrimal duct, Sprague-Dawley rat, rodentia. Etiology--chronic experimental fluorosis.

These sections were prepared from tissue collected from rats that were given 10 or 25 mg/kg/day/os of sodium fluoride for 2 years. Although the sections were cut from several blocks, each slide shows lesions that are expected in rats with chronic fluorosis.

The ameloblastic layer is dysplastic and characterized by irregular flattening and loss of ameloblasts, and herniation of ameloblasts into enamel. In some sections there are inclusions of enamel in the ameloblastic layer. The ameloblastic lesions were diffuse in these sections, but were multifocal and less severe in rats given lower doses. Enamel was incompletely and irregularly formed. The incisors were frequently malformed as demonstrated by the irregular shape of the teeth. However, we did not demonstrate treatment-related lesions in odontoblasts, predentin or dentin in our study.

Subperiosteal hyperostoses were found frequently in cranial bones, ribs, sternum, and vertebra. The hyperostoses were bilaterally symmetrical and characterized by the subperiosteal proliferation of mature bone. In membranous bones, the new bone appeared to form diffuse sheets of lamellar bone that resulted in thickened bones with a rough periosteal surface. In sections submitted for this conference, the excessive bone proliferation is most obvious in dorsal portions of

the frontal and maxillary bones. Because the subperiosteal deposition of new bone is often uniform, one must be familiar with the normal shape and thickness of the bones or the microscopic lesions may be missed.

Darkly eosinophilic or basophilic granules of variable size were scattered throughout the bones and teeth and are similar to those reported in previous studies in which rats were given fluoride salts. The granules are calcium-fluoride (CaF_2) crystals that precipitate when formalin-fixed tissue is routinely decalcified in the presence of fluoride ions. These granules are not biologically important except to indicate that fluoride is present. Cement lines are prominent because small CaF_2 crystals are precipitated in those areas.

The mucosal and submucosa of the nasolacrimal ducts contained variable numbers of lymphocytes, mast cells, and macrophages. In addition, a keratinized cyst is found in nasolacrimal duct of some sections. The lesions in nasolacrimal ducts were not caused by sodium fluoride.

AFIP Diagnoses. 1) Hyperostosis, diffuse, mild to moderate, with calcium fluoride granules, cranial bones, Sprague-Dawley rat, rodent, etiology--compatible with fluorosis 2) Ameloblastic dysplasia, bilateral, diffuse, moderate, with calcium fluoride granules, enamel organ, incisor (per contributor).
3) Inflammation, mononuclear, mild, diffuse, with areas of squamous differentiation and keratin cysts (not present in all sections), nasolacrimal duct.

Conference Note. Some participants preferred a diagnosis of osteopetrosis over hyperostosis. Woodard (1978), however, defines hyperostosis as bone hypertrophy which results from mechanisms other than those of adaptive reconstruction; fluorine poisoning is given as a cause of a hyperostotic process involving bone resorption and regeneration. Osteopetrosis on the other hand, is probably best known as a sequela of retrovirus-induced hyperostosis in birds; it is also seen as a specific entity in various animal species and is often thought to be congenital.

Most participants thought the scalloped appearance of the enamel organ was due to segmental hyperplasia of ameloblasts (which were sometimes piled up and undulating). Enamel was absent in some sections.

The differential diagnosis discussed included toxicities due to fluoride, lead, zinc, elemental phosphorus, hypervitaminosis D_3 or a plant with D_3-like activity.

Contributor. The Procter & Gamble Company, Miami Valley Laboratories, P.O. Box 39175, Cincinnati, Ohio 45247.

Suggested reading.

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Case II - 84-2043 (AFIP 1947994).

History. Tissues from 5-week-old female Rhode Island red chickens (Gallus domesticus). The owner received a shipment of newly hatched chicks from a commercial hatchery 31 days previously. Losses started immediately. By the time 2 live and 2 dead birds were submitted for diagnosis losses had reached 50 percent. Signs of illness were not observed until shortly before death. Prostration and opisthotonus predominated.

Gross Pathology. Hearts were enlarged and waxy-white. There was a small amount of clear pericardial fluid. Spleens were enlarged slightly. Pale foci up to 2 mm in diameter were noted in lungs. Cecums were distended with caseous casts.

Laboratory Results. Salmonella pullorum was cultured from pericardial fluid, liver, intestine and a swab of peritoneal surfaces. Proteus also grew in profusion on media inoculated from liver. The National Veterinary Services Laboratory, APHIS, USDA, Ames, Iowa typed the S. pullorum isolate as the standard strain.

Contributor's Diagnosis & Comment. Myocarditis, chronic, diffuse, severe, due to infection with Salmonella pullorum, standard strain.

Pullorum disease has been subjected to a relatively effective control program since 1935 and is no longer the subject of much interest to diagnosticians. A survey of medical indices back to 1975 produced 2 references, one to pullorum disease in the Somali Democratic Republic. However, the disease persists among chickens raised by hobbyists, and as in this example, occasionally intrudes upon a commercial hatchery. It remains a diagnostic challenge. Multiple tissues are affected (heart muscle, pericardium, lungs, liver, large intestine and gizzard) with necrosis, abscessation and diffuse inflammation. The birds submitted in this case had severe vasculitis with perivascular cuffing and leukocyte infiltration of adjacent brain, principally in and around the cerebellum. Heart was selected for submission not because it provides clues to a diagnosis but as an example of the extreme degree to which tissue damage may be attributable to this organism.

AFIP Diagnosis. Myocarditis, granulomatous, diffuse, severe, heart, Rhode Island red, chicken, avian, etiology--compatible with Salmonella spp.

Conference Note. In the moderator's opinion the modifier of granulomatous is inappropriate because the inflammation lacks multinucleated giant cells. Most participants thought the severe infiltration of the heart by a relatively pure population of macrophages could initially be confused with Marek's disease or lymphoid leukosis. The birds in this case, however, began dying at several days of age. Birds afflicted with Marek's disease usually do not show clinical signs before 2-3 months of age. The neoplastic cell population is pleomorphic with cells ranging from small to medium in size. Lymphoid leukosis usually affects older birds 14-16 weeks of age; the neoplastic cell population is monomorphic and composed of large blast cells.

Infection by Salmonella pullorum may be histologically indistinguishable from paratyphoid (S. typhimurium most commonly) and typhoid (S. gallinarum). Acute cases of pullorum or paratyphoid are usually only seen in young birds (less than 5 weeks), whereas typhoid may preferentially affect growing or mature birds (Whiteman, Bickford; 1979).

Although S. pullorum is known to elaborate a toxin which is highly pathogenic for some species other than chickens, the toxin produces no symptoms when introduced into chicks by any route. The disease is therefore thought to be due to septicemia rather than to toxemia (Snowyenbos, 1978).

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Suggested reading.

Carlton, W.W. and Hunt. R.D.: Bacterial diseases. Chapt 14. In Pathology of Laboratory Animals. Vol. II, Benirschke, K., Garner, F.M., Jones, T.C. (Eds.), Springer-Verlag, 1978, p. 1444.

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Case III - 84-8223 (AFIP 1948001).

History. Tissue from a 2-year-old female Angus. Four of 100 cattle ill over a period of 3-4 weeks, each with crusty dermatitis over face, neck, back, perineum. Salivation and dyspnea in some. Two died after illness of 1-2 weeks.

Gross Pathology. Multifocal grayish nodules and or streaks in renal cortex, adrenal medulla and cortex, and myocardium.

Contributor's Morphologic Diagnoses.
Skin, dermatitis, granulomatous.
Heart, myocarditis, granulomatous.

AFIP Diagnoses. 1) Myocarditis, granulomatous, eosinophilic, multifocal, moderate, with multinucleated giant cells and myofiber degeneration, heart, Angus, bovine. 2) Dermatitis, subacute, eosinophilic, diffuse, mild to moderate, skin, etiology--compatible with hairy vetch (Vicia villosa Roth) toxicosis. 3) Sarcocysts, multifocal, myocardium.

Conference Note. Discussion of the lesions centered on the giant cell population. Some participants thought there were two types present. 1) One being classical Langhans' cells involved in inflammation, and, 2) the other, which are sometimes elongate, and containing numerous intensely eosinophilic granules, suspected of being degenerated, attenuated myofibers. The lesions in the skin resemble those seen in allergic dermatitis.

The presence of numerous intralesional multinucleated giant cells, in the absence of an infectious agent, is considered characteristic of hairy vetch toxicity. The lesions in some cases are said to resemble those seen in tuberculosis, malignant catarrhal fever, and even malignant lymphoma.

Three syndromes are associated with hairy vetch toxicity. The first is an acute fatal neurologic disease resembling rabies, and is associated with ingestion of the seeds alone. The second consists of nasal discharge, mucous membrane congestion and subcuticular swelling; it is associated with inflammation of the forestomachs, bronchitis, pneumonia and a yellowish liver. The third syndrome is seen in cattle usually over 3-years-old which have grazed hairy vetch pastures for several weeks; the primary findings are dermatitis, conjunctivitis, and edema of the eyelids. Eosinophilic granulomatous infiltrates (including multinucleated giant cells) are seen in the kidneys, heart, adrenal and dermis. The mortality reaches 50%.

The toxic principle has not been elucidated; an attempt to reproduce the disease experimentally in cattle was unsuccessful. There has recently been one report of hairy vetch toxicity in a horse (Anderson, Divers, 1983). Other species of Vicia are also toxic to animals including man. It has been reported that seeds and vegetative portions of the plants contain cyanogenic glycosides and other potential toxins. Hemolytic anemia known as favism is seen in people who ingest the bean of V. faba.

Contributor. College of Veterinary Medicine, Oklahoma State University, Stillwater, Oklahoma 74078.

Suggested reading.

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Kerr, L.A., Edwards, W.C.: Hairy vetch poisoning of cattle. Vet. Med./Sm. An. Clin. 257-258, 1982.

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Case IV - 1164 (AFIP 1849453).

History. Tissue from a 2-1/2 week old female Hereford calf. Two calves out of 10 calves had anorexia, labored breathing, and elevated temperatures of 107° F. Clinical signs appeared approximately 2 weeks after birth and death usually occurred within 3 days.

Gross Pathology. The anterior-ventral aspects of the left and right apical and cardiac lung lobes were dark red, firm, and edematous. The abomasum, small intestine, and large intestine contained abundant watery yellow green material.

Laboratory Results.
Virology: (Intestinal fluid): Adenovirus identified by electron microscopy.
Parasitology: Negative.
Microbiology: Liver, spleen: No growth.
Lung: alpha Strep, rough E. coli.
Intestine: alpha Strep.

Contributor's Morphologic Diagnoses. 1) Moderate acute to subacute multifocal necrotizing hepatitis. 2) Severe acute multifocal necrotizing splenitis with moderate lymphoid necrosis. 3) Severe acute multifocal necrotizing lymphadenitis with moderate lymphoid necrosis. 4) Vascular thrombosis, liver, spleen, lymph node. 5) Intranuclear amorphous basophilic inclusions, endothelial and reticuloendothelial cells, liver, spleen, lymph node.
Etiology: Adenovirus.

AFIP Diagnoses. 1) Hepatitis, necrotizing, acute, multifocal, mild to moderate, with numerous basophilic intranuclear inclusion bodies, liver, Hereford, bovine. 2) Splenitis and lymphadenitis, necrotizing, acute, diffuse, mild, with multifocal basophilic intranuclear inclusion bodies, spleen and lymph node. 3) Depletion, lymphoid, diffuse, moderate, spleen and lymph node; etiology--compatible with adenovirus.

Conference Note. Intranuclear inclusion bodies are seen primarily in cells of the reticuloendothelial system; in the liver, however, inclusions are occasionally present in hepatocytes. The vascular thromboses noted by the contributor are not present in any sections examined by participants.

Bovine adenovirus (BAV) has been incriminated as an etiologic agent in calves with respiratory and enteric infections and in cattle with hemorrhagic gastroenteritis ("enzootic diarrheal disease"). The virus is isolated from clinically normal cattle, and overt disease due to BAV is thought to be uncommon. Ten serotypes have been isolated to date, and of those, two (types 3 and 5) are more pathogenic than the others. BAV is also thought to be the cause of "weak calf syndrome" of neonatal calves, which is characterized by subcutaneous and synovial lesions of the legs and by gastrointestinal disease. Cutlip and McClurkin (1975) found herd morbidity in areas of the northwestern U.S. to range from 6-15% with mortality ranging from 60-80% in untreated calves. Other authors think that BAV infection is aided by inadequate colostrum intake or by concurrent infection with IBR and BVD (Thompson, Thomson, Henry, 1981). This is especially likely since immunologic incompetence is thought to be a factor in equine and human adenoviral diseases (Bulmer, Tsai, Little, 1975).

The lesions in calves are attributed, by most authors, to BAV infection of endothelial cells with resultant vasculitis, thrombosis, and subsequent ischemic necrosis of dependent tissues. These lesions differ from those in foals and pigs in which adenovirus inclusions are usually seen only in epithelial cells, and results in a less severe disease.

There has been considerable interest in bovine adenovirus type 3 (BAV 3) as a result of its oncogenic capability and due to the 25% homology between the DNA of BAV 3 and human adenovirus type 5.

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Suggested reading.

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Cutlip, R.C., McClurkin, A.W.: Lesions and pathogenesis of disease in young calves experimentally induced by a bovine adenovirus type 5 isolated from a calf with weak calf syndrome. Am. J. Vet. Res. 36: 1095-1098, 1975.

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Results
AFIP Wednesday Slide Conference - No. 14
9 January 1985

Conference Moderator: Jerrold M. Ward, DVM, PhD
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Case I - 11-01907-2 and 3 (AFIP 1945148).

History. An 11-month-old female rnu/rnu N:NIH rat was injected at 2 months of age with nitrososmethylurea. It developed wasting disease at 10-11 months of age.

Gross Pathology. Lungs - did not collapse, diffusely discolored and consolidated.

Contributor's Diagnosis & Comment. Interstitial pneumonia, Pneumocystis carinii.

This rat was one of three injected with NMU and which developed pneumonia due to P. carinii. No other nude rats in the colony developed this pneumonia although they had papovaviral pneumonia or bacterial bronchopneumonia. The 3 rats had the same atypical lesions for P. carinii, i.e. few areas of foamy material within alveoli, the classical lesion associated with this organism. With GMS staining, many organisms can be seen, frequently individually within alveoli.

AFIP Diagnoses. 1) Pneumonia, interstitial, granulomatous, multifocal, with intra-alveolar parasitic forms, lung, rnu/rnu N:NIH rat, rodent. 2) Lymphadenitis, granulomatous, subacute, diffuse, moderate, with numerous eosinophils, lymph node.

Conference Note. The discussion centered on the lung lesions which were considered by all participants to be atypical of pneumocystosis. The honey-combed foamy material which typically fills alveoli in Pneumocystis infection is only seen rarely in these sections. The number of organisms is also less than seen in typical cases of pneumocystosis. Some participants speculated that the pneumocystosis was being resolved by host defense mechanisms, and that the interstitial inflammation may have been due to other causes, possibly a virus.

The differential diagnosis included histoplasmosis, toxoplasmosis, candidiasis, mycoplasmosis and Sendai virus infection. Most animals which develop clinical pneumocystosis are immune suppressed; in this case, the rats were given an immunosuppressive drug (nitrosomethylurea) 9 months prior to their sacrifice. The relation of the drug to the lesions present in this case can therefore not be determined.

Bronchial associated lymphoid tissue (BALT) is normally found in rats, even nude rats such as the N:NIH strain. BALT is not prominent in normal mice. The moderator considered the amount of BALT in these sections to be less than normal indicating some lymphoid depletion. Beaver and Jung (1984) describe intra- and extracellular phases of the life cycle of Pneumocystis based on ultrastructural studies of the lungs of young rats.

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Suggested reading.

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Hsu, C. K.: Parasitic Diseases in the Laboratory Rat. Vol. I, (H.J. Baker, J.R. Lindsey, S.H. Weisbroth, Eds.), Academic Press, New York, 1979, 315-317.

Seed, T. M. and Aikawa, M.: Pneumocystis. In Parasitic Protozoa. Vol. IV, J. P. Kreier (Ed.), Academic Press, 1977, 329-357.

Case II - S83-1111 (AFIP 1947995).

History. This 7-year-old spayed female springer spaniel was presented to a local animal hospital with a complaint of anorexia and depression of about a month's duration. Physical examination revealed hepatosplenomegaly and icterus, and a mass in the right inguinal mammary gland. The owner elected euthanasia and the animal was necropsied at the clinic.

Gross Pathology. A 1x2 cm ulcerated skin lesion was noted on the left carpus. It exuded cloudy brown exudate when squeezed. The right inguinal mammary gland contained a 6 cm white mass. Mucous membranes, fat and viscera were stained yellow. The liver was enlarged, bulge on section and stipled with 1-2 mm gray-white foci. The spleen was swollen and dark. The left renal cortex contained a 4 cm yellow caseopurulent mass. Large numbers of heartworms were found in the right atrium and ventricle, pulmonary arteries and vena cava. The left diaphragmatic lung lobe had a 2 cm nodule in the parenchyma. It had brown-white caseous appearance on section.

Laboratory Results.

WBC	$25x10^3/mm^3$	Neutrophils	81%
		Bands	15%
		Lymphocytes	1%
		Monocytes	none
		Platelets	$25x10^3$
Bilirubin	1.9 mg/dl		

Contributor's Diagnosis & Comment.

MDX: Liver - 1) Severe multifocal acute-subacute necrotizing hepatitis.
2) Mild subacute multifocal nonsuppurative pericholangitis.
3) Intrahepatic bile stasis.
4) Minimal multifocal extramedullary hematopoiesis.

Diagnosis: Tyzzer's disease. Etiology: Bacillus piliformis.

Disseminated throughout the section of liver are abundant, frequently coalescing foci of necrosis surrounded by intense inflammatory infiltrates consisting primarily of neutrophils. Occasional hepatocytes at the margins of some necrotic areas contain faint criss-crossing patterns. Kupffer cells are frequently distended with yellow-green granular pigment (bile?). Bile canaliculi are frequently plugged with bile. Scattered portal areas contain moderately abundant plasma cells. An occasional sinusoid contains erythroid, granulocytic and megakaryocytic precursors.

The renal lesion histologically was a necrotizing granulomatous reaction associated with a fungus having slender dichotomously branching, septate hyphae compatible in morphology with Aspergillus. Also present in the kidney were multiple granulomas containing nematode larvae. The mammary mass was a mixed mammary tumor. The pulmonary lesion represented a previous verminous embolism of Dirofilaria immitis. The animal was apparently infected by ingesting rodent fecal contaminated feed.

Special stains confirmed the presence of intracellular, criss-crossing rod-shaped bacteria compatible in morphology with Bacillus piliformis. Tyzzer's disease usually affects young and weakened, immunocompromised animals. Frequently an enteritis is also present; unfortunately, the GI tract was not examined by the submitting practitioner. The source of the mycotic nephritis was not determined.

AFIP Diagnosis. Hepatitis, necrotizing, subacute, multifocal, moderate, with elongate intracellular bacilli, liver, springer spaniel, canine, etiology--compatible with Bacillus piliformis.

Conference Note. In some sections there are varying amounts of hemorrhage within necrotic foci. The granulomatous response associated with most necrotic areas is unusual, and was considered by participants to indicate a more chronic disease course than is usually seen. In the foal, for instance, acute necrosis with minimal inflammation is typical.

Tyzzer's disease has only been reported several times in the dog and is thought to be acquired by contacting or ingesting rodent feces containing bacterial spores. Following infection, local proliferation of organisms is thought to take place in intestinal epithelial cells with subsequent spread to the liver following stressful conditions. Colonization of the hepatic parenchyma results in multifocal hepatic necrosis presumably as the result of an unidentified toxin. In rodents and lagomorphs, spread to the heart is also seen and thought to occur via the lymphatics.

Contributor. College of Veterinary Medicine, Mississippi State University, Missisissippi State, Mississippi 39762.

Suggested reading.
Benirschke, K., Garner, F. M. and Jones, T. C. (Eds.): Pathology of Laboratory Animals. Vol. II, Springer-Verlag, 1978, 1380-1384.
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Case III - 12-07539 or 12-07537 (AFIP 1945165).

History. Tissue from 16-month-old female BALB/c nu/+ mouse. The dam of this mouse received ethylnitrosourea intraperitoneally on day 16 of gestation. The mouse was sacrificed at 16 months old.

Gross Pathology. Multiple nodules were found throughout the lungs.

Contributor's Diagnosis & Comment. 1) Papillary adenocarcinomas of the lung (of alveolar type II cell origin). 2) Solid adenomas of the lung (of alveolar type II cell origin). 3) Hyperplasia of alveolar macrophages.

The papillary adenocarcinomas have been described as derived from Clara cells (Kauffman, 1979). Our investigation of the immunocytochemistry of these and other pulmonary tumors of the mouse has revealed that these tumors contained the apoprotein of surfactant but no Clara cell antigens. These findings suggest that these tumors are derived from alveolar type II cells.

AFIP Diagnosis. Adenocarcinoma, papillary and solid, lung, BALB/c, mouse, rodent.

Conference Note. Participants noted several morphologic patterns within this pulmonary neoplasm. In some areas, the tumor appears solid, and at higher magnification neoplastic cells can be seen to line alveolar septa and eventually fill the alveolus. Such a pattern is described for alveolar tumors of type II pneumonocytes described by Kauffman (1979). In other areas, the tumor consists of papillary or tubular arrays and corresponds with the Clara cell neoplasm described by Kauffman. Aside from morphologic differences seen at the light microscopic level, these two types of neoplasms were further differentiated by Kauffman based upon ultrastructural morphology.

In a study (Ward et al., 1985) by the moderator, who contributed this case, all areas of this neoplasm are negative for Clara cell antigen and positive for surfactant apoprotein, suggesting even papillary neoplasms are derived from type II pneumonocytes. However, as pointed out by the moderator, cells from papillary neoplasms may be Clara cells which have not yet produced Clara cell antigen. The importance in differentiating solid from papillary tumors resides in their biological behaviors: solid tumors grow very slowly and are considered benign, while papillary tumors grow and invade very rapidly and are considered malignant. Both the solid and papillary neoplasms of mice bear some morphologic similarities to bronchioloalveolar carcinomas of man.

The supra-numerous alveolar macrophages in alveoli surrounding the tumors are typically seen in mice with multiple lung tumors.

Contributor. Laboratory of Comparative Carcinogenesis, Frederick Cancer Research Center, NIH, Frederick, Maryland, 21701.

Suggested reading.

Heath, J. E., Frith, C. H. and Wang, P. M.: A morphologic classification of alveolar-bronchiolar neoplasms in BALB/c female mice. Lab. Anim. Sci. 32: 638-647, 1982.

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Case IV - r-82-634 (AFIP 1947842).

History. Tissue from a 6-month-old Sprague-Dawley male rat that was one of 600 rats used in a 2-year carcinogenicity study; clinical signs prior to sacrifice included posterior paralysis, brown discolored urine and slight body weight loss.

Contributor's Diagnosis & Comment. Stem cell leukemia characterized by marked proliferation of leukemic cells in bone marrow (lumbar vertebrae) with encroachment of spinal cord.

Etiology of stem cell leukemia is not known; however, possibility that a virus (mouse leukemia virus) may be involved.

Three cases of stem cell leukemia were found, one in each control, mid and high dose groups of a carcinogenicity study, consisting of 600 rats. The age of each rat was approximately 6 months, with typical clinical signs of posterior paralysis and primary involvement of bone marrow, liver and spleen in each case.

AFIP Diagnosis. Stem cell neoplasia, vertebral body and liver, Sprague-Dawley rat, rodent.

Conference Note. Neoplastic cells in both the vertebral body and liver have scant amounts of cytoplasm, and pleomorphic nuclei which are indented and deformed. Nuclei often have large nucleoli and special stains fail to demonstrate cytoplasmic granules. In the experience of the moderator, these findings are suggestive of stem cells, in contrast to the round nuclei of blast cells and myeloid cells. The moderator further stated that even the slightest amount of tissue autolysis will cause distortion of round nuclei, and that blood smears are the only proper means of determining cellular morphology.

The diagnosis of stem cell leukemia in young Sprague-Dawley rats is based upon the lack of peroxidase in neoplastic cells. Spontaneous leukemias in rats less than 1 year old are regarded as rare; the occurrence of stem cell leukemia in young

rats (mean age 180 days) is reminiscent of childhood leukemias. Cellular infiltration of the liver, spleen and bone marrow is an outstanding feature of stem cell leukemias. The bone marrow is most extensively involved, and a high percentage of rats show evidence of CNS involvement, as is seen in this case.

Contributor. Sterling-Winthrop Research Institute, Rensselaer, New York 12144.

Suggested reading.

Richter, C. B., Estes, P. C. and Tennant, R. W.: Spontaneous stem cell leukemia in young Sprague-Dawley rats. Lab. Invest. 26: 419-428, 1972.

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Results
AFIP Wednesday Slide Conference - No. 15
16 January 1985

Conference Moderator: Miriam R. Anver, D.V.M.
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Case I - 84-242 (AFIP 1945160).

History. Tissue from a 12-year-old male boxer dog with a history of upper respiratory obstruction by a "bladder" attached to the caudal/lateral aspect of the tongue and adjacent buccal mucosa. It contained gelatinous straw-colored and white material.

Gross Pathology. A circular flange of soft tissue (25mm x 5mm diameter) was found. One side was smooth and grey; the other was rough and dark. The cut surfaces were firm and fibrous.

Contributor's Diagnosis & Comment. The histological appearance of this cyst wall is of chronic reaction to extravasated salivary secretion. The site described is one of the less common ones for salivary mucocele (C.E. Harvey et al., 1983; Hulland and Archibald, 1964; Harvey, 1981).

A section of hyperemic fibrovascular connective tissue is seen. One surface is partly covered by unremarkable stratified squamous epithelium. Beneath this are salivary (mucus) acini, ducts and a few lymphocytes. The other flat surface is formed by an irregular accumulation of hyaline eosinophilic material that rests on a thick layer of inflamed granulation tissue in which there is plentiful hemosiderin. In places the surface bears some stratified epithelium. The hyaline surface material reacts weakly for mucus with mucicarmine and PAS stains.

AFIP Diagnosis. Cyst (mucocele), with surrounding chronic inflammation and granulation tissue, pharynx (per contributor), boxer, canine.

Conference Note. The discussion centered on the identity of the pink hyalin material along the luminal surface of the cyst. Some participants thought it to be degenerated skeletal muscle; however, the consensus was that it represented a mixture of necrotic debris, mucin, and possibly fibrin. A few participants commented that the amount of granulation tissue present in this case is considerably less than is usually seen in association with mucoceles. This was considered an indication that the lesion was relatively new (several days to 1 week old). In many sections, remnants of the ruptured salivary duct epithelium are present.

A differential diagnosis of ranula, and of branchial and thyroglossal duct cyst was discussed. These are lined by an epithelium, ciliated in the case of the branchial cyst, while the mucocele only has remnants of epithelium. A ranula lies along the course of the sublingual and submandibular ducts in the floor of the mouth, and is more common than the subpharyngeal mucocele. Either, however, can be a problem clinically and must often be dissected out surgically to effect a cure. A familial predisposition in boxer dogs has been suggested due to a high prevalence among siblings in some litters.

Contributor. Department of Veterinary Pathology, University of Liverpool, P.O. Box 147, Liverpool L69 3BX, England.

Suggested reading.

Harvey, C. E., O'Brien, J. A., Rossman, L. E. et al.: Textbook of Veterinary Internal Medicine. Ettinger, S. J. (Ed.), Vol. II, 2nd Ed., W. B. Saunders, 1983, p. 1183.

Harvey, H. J.: Pharyngeal mucoceles in dogs. J. Am. Vet. Med. Assoc. 178: 1282-1283, 1981.

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Case II - 83-199 (AFIP 1900660).

History. A laryngeal mucosal tumor from an 8-1/2 year old male dog was excised and submitted for histopathologic diagnosis. The dog was exhibiting dysphagia and stridor of increasing severity over a 2-month period.

Contributor's Diagnosis & Comment. Canine laryngeal oncocytoma. This is a rare primary neoplasm of the canine larynx consisting of a uniform population of cells with eosinophilic cytoplasm and large round nuclei containing eosinophilic or clear inclusions. Ultrastructurally the cells contain numerous mitochondria. The inclusions consist of cytoplasmic invaginations (eosinophilic inclusions) and glycogen accumulation (clear inclusions).

AFIP Diagnosis. Oncocytoma, larynx (per contributor), breed unspecified, canine.

Conference Note. The discussion centered on the differential diagnosis which included oncocytoma, granular cell tumor (granular cell myoblastoma), rhabdomyosarcoma, solid carcinoma, and chemodectoma. Populations of cells within this neoplasm have intensely-eosinophilic, granular cytoplasm. Special stains reveal many of the cytoplasmic granules to be PAS-positive and diastase resistant, as are many of the clear intranuclear inclusions noted to by the contributor. Phosphotungstic acid hematoxylin (PTAH) staining demonstrates the cytoplasm of all tumor cells to be filled with fine PTAH-positive granules. These were thought by participants to correspond to the numerous mitochrondria noted in the contributor's ultrastructural examination of tumor cells. The Department of Otolaryngic Pathology concurred with the diagnosis of oncocytoma based upon the histologic appearance of the tumor (H&E and special stains) and the contributor's ultrastructural findings. Participants were in agreement, however, that a definitive diagnosis cannot be made based upon H&E sections alone.

Canine laryngeal oncocytomas were first described by Pass, Huxtable, Cooper et al. in 1980, and have been reported several times more recently. Oncocytes are poorly-understood epithelial cells scattered through major endocrine and exocrine glands and within seromucinous glands of the upper airways and digestive tracts of man. Similar cells are known by the names of "oxyphil" cells (parathyroid) and "Huerthle" cells (thyroid). In old dogs oncocytic cells are commonly found in the ductal epithelium of salivary glands. Oncocytes were originally thought to be degenerative but have since been shown to have high mitochondrial enzyme activity

and a high rate of mitochondrial division. Lundgren, Olofsson, and Hellquist (1982) suggest that an increase in mitochondria as a compensatory hyperplasia is perhaps initiated by an age-related exhaustion of one or more mitochondrial enzyme systems. This process would ultimately lead the normal cell to oncocytic metaplasia.

Contributor. The Procter & Gamble Company, P.O. Box 39175, Cincinnatti, Ohio 45247.

Suggested reading.

Bright, R. M., Gorman, N. T., Goring, R. L. et al.: Laryngeal neoplasia in two dogs. J. Am. Vet. Med. Assoc. 184: 738-740, 1984.

Calderwood-Mays, M. B.: Laryngeal oncocytoma in two dogs. J. Am. Vet. Med. Assoc. 185: 677-679, 1984.

Lundgren, J., Olofsson, J. and Hellquist, H.: Oncocytic lesions in the larynx. Acta Otolaryngol. 94: 335-344, 1982.

Pass, D. A., Huxtable, C. R., Cooper, B. J. et al.: Canine laryngeal oncocytomas. Vet. Path. 17: 672-677, 1980.

Thackray, A. C. and Lucas, R. B.: Tumors of the Major Salivary Glands. 2nd Series, Fascicle 10, Atlas of Tumor Pathology, AFIP, 1974, pp 56-59.

Wheeldon, E. B., Suter, P. F., Jenkins, T.: Neoplasia of the larynx in the dog. J. Am. Vet. Med. Assoc. 180: 642-647, 1982.

Case III - R80-120 (AFIP 1902454).

History. This 12-month-old crossbred sow had received artificial insemination several times, but did not conceive. She showed signs of lameness and endometritis about 20 days prior to necropsy.

Gross Pathology. The right uterine horn appeared firm and distended. A great amount of purulent material filled the lumen. However, the left uterine horn and the ovaries were grossly normal.

Laboratory Results. A culture of the uterine discharge was made. A great number of Staphylococcus colonies were isolated from the uterine discharge.

Contributor's Diagnosis & Comment. Endometritis in the gilt is not common, except that infection is introduced by careless use of an instrument, or it may occur at the time of breeding. Einarsson (1980) reported that E. coli, Staphylococci and Streptococci are often isolated from endometritis and vaginal discharges. Bacteria which can cause endometritis are as follows: Streptococci, Staphylococci, E. coli, Corynebacterium pyogenes, Pasteurella multocida, Klebsiella, Pseudomonaceae, Salmonella spp. and Mycoplasma.

Histologically, the uterus was filled with large amounts of suppurative exudate, and its mucosa was severely necrotic.

AFIP Diagnosis. Endometritis, necropurulent, acute, with myriads of intraluminal cocci, uterus, crossbred, porcine, etiology--Staphylococcus sp.

Conference Note. Participants noted one large area and numerous smaller areas of endometrial ulcerations in most sections examined. Additionally, an abscess deep in the endometrium was thought by most to involve a uterine gland. Most uterine glands are atrophic, areas of the stroma are hyalinized and contain variably-sized collections of fibrin. The numerous cells containing eosinophilic cytoplasmic granules were thought by most participants to be eosinophils which are commonly seen in many inflammatory conditions of swine; some participants, however, speculated that some may be endometrial granulocytes (which elaborate relaxin) commonly seen in rodents and primates. Similar cells are scattered throughout the ovarian stroma. Additionally, the Department of Gynecologic and Breast Pathology noted mild, acute oophoritis in the sections they examined.

The differential diagnosis included infection by Staphlococci, E. coli and Brucella. Special stains demonstrate only gram-positive cocci in the lumen of the uterus. As was noted by the contributor, Staphlococcus spp are thought to be a common cause of iatrogenic infections in animals. Septicemias involving S. aureus are commonly seen in laboratory primates following venapuncture, and the placement of intravascular catheters.

Contributor. Department of Veterinary Medicine, Animal Industry research Institute, TSC, Chunan, Miaoli, Taiwan 350, Republic of China.

Suggested reading.

Einarsson, S.: Repeat breeding in swine. In Current Therapy in Theriogenology. Marrow, D. A. (Ed.), Saunders Company, Philadelphia, London, Toronto, 1980.

Everitt, J. I., Fetter, A. W., Kenney, R. M. et al.: Porcine necrotizing Staphlococcal endometritis. Vet. Path. 18: 125-127, 1981.

Fennestad, K. L., Stovlback, P., Moler, T.: Staphlococcus aureus as a cause of reproductive failure and so-called actinomycosis in swine. Nord. Vet. Med. 7: 929-947, 1955.

Tharp, V. L.: Metritis, mastitis and agalactia. In Disease of Swine. Dunne, H.W.H. (Ed.), Iowa State University Press, Ames, 1971, p. 869.

Thorne, H. and Nilsson, P. O.: Staphlococcus aureus as the cause of abortion in swine. Acta Vet. Scand. 2: 311-316, 1961.

Case IV - 84D842-1 (AFIP 1943462). (2 kodachrome slides).

History. Tissue from a 1-1/2 year old female stumptail monkey (Macaca arctoides). The face, trunk, arms, and legs developed multiple white raised plaques which were not pruritic.

Gross Pathology. See kodachrome slide 1.

Laboratory Results. See kodachrome slide 2 (skin scraping).

Contributor's Diagnosis & Comment. Cutaneous acariasis - Psorergatic spp. Multiple young animals in the group were collected. Multiple skin scrapings rerouted numerous Psorergatic mites, occasional Demodex mite, and a third mite which has not yet been identified.

AFIP Diagnosis. Hyperkeratosis and acanthosis, segmental, moderate, with intracorneal acarid parasites, stumptail macaque, primate.

Conference Note. As a differential diagnosis for the most numerous parasites present in the histological sections, participants considered lice and mites. Most thought these parasites are too small to be lice. The parasite in the skin scraping (kodachrome slide 2) has 4 pairs of legs and is compatible with a mite; lice have only 3 pairs. This organism has a round body differentiating it from Demodex, the body of which is elongate. Sarcoptes, and several other skin mites, have tarsal suckers and the first two pair of legs are located close to the capitulum while the second two pair are further caudad. The mite in this case does not have tarsal suckers. The morphologic characteristics of this mite are compatible with Psorergates. Participants thought that the dermatitis present in most cases of Sarcoptes would be more severe. In some sections, a larger elongated mite is present in a hair follicle. Although it could not be identified based upon its morphology in the sections examined, most felt it was compatible with Demodex, as noted by the contributor.

A very mild, sometimes minimal (as in this case) inflammatory response is typical of Psorergates infection. Mites live in the stratum corneum, where it is believed they encyst by excavatation of keratin with saw-like teeth and feed by piercing cells with styliform chelicerae.

Contributor. Department of Comparative Medicine, Hershey Medical Center, Pennsylvania State University, Hershey, Pennsylvania 17033.

Suggested reading.

Ah, H. S., Peckham, J. C., Atyeo, W. T.: Psorergates glaucomys sp. N. (Acari: Psorergatidae), a cystogenous mite from the southern flying squirrel (Glaucomys V. volans), with histopathologic notes on a mite induced dermal cyst. J. Parasitol. 59: 369-374, 1973.

Baskin, G. B., Eberhard, M. L., Watson et al.: Diagnostic exercize. Lab. Anim. Sci. 34: 602-603, 1984.

Lee, K. J., Lang, C. M., Hughs, H. C. et al.: Psorergatic mange (Acari: Psorergatidae) of the stumptail macaque (Macaca arctoides). Lab. Anim. Sci. 31: 77-79, 1981.

Sheldon, W. G.: Psorergatic mange in the sooty mangabey (Cercocebus torquates atys) monkey. Lab. Anim. Care 16: 276-279, 1966.

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Results
AFIP Wednesday Slide Conference - No. 16
23 January 1985

Conference Moderator: George A. Parker, D.V.M.
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Great Falls, VA 22066

Case I - N84-0210 (AFIP 1944522) (1 kodachrome slide).

History. Tissue from a male Sprague-Dawley rat. A majority of the rats in arrival quarantine began exhibiting photophobia, exophthalmos, and chromodacryorrhea. The rats had been in quarantine for 9 days when clinical signs began. Rats sacrificed from the same lot 9 days earlier for quality control monitoring were clinically, grossly, and histologically normal.

Gross Pathology. There was unilateral, focally-extensive, reddish-gray discoloration and edema affecting one-half to two-thirds of the harderian glands.

Laboratory Results. Affected animals had positive titers for sialodacryoadenitis virus (SDAV), while serum samples from normal quality control animals taken earlier from the same lot were negative.

Contributor's Diagnosis & Comment. Dacryoadenitis, necrotizing and suppurative with ductal squamous metaplasia, focally extensive, unilateral, Harderian gland, Sprague-Dawley rat.

Dacryoadenitis caused by sialodacryoadenitis virus (SDAV) was diagnosed based on typical clinical signs and gross and histological lesions. Confirmation of SDAV was made by identification of anti-SDAV antibodies by the ELISA test. Retrospective ELISA tests on serum from animals sacrificed on arrival for quality control monitoring were negative for SDAV. We were unable to positively identify where the affected rats contacted SDAV. Neither our facility nor the vendor have a recent history of SDAV outbreaks.

Both the Harderian and extraorbital lacrimal glands from affected animals exhibited lesions. Examined salivary glands were free of disease.

AFIP Diagnosis. Dacryoadenitis, necrotizing, subacute, diffuse, moderate, with ductal squamous metaplasia, unilateral, Harderian gland, Sprague-Dawley rat, rodent, etiology--compatible with sialodacryoadenitis virus (SDAV).

Conference Note. The kodachrome slide in this case illustrates the cervical swelling, exophthalmos, and chromodacryorrhea (although mild) which are characteristic of but not pathognomonic for sialodacryoadenitis virus (SDAV) infection of rodents. Chromodacryorrhea, or red tears, can be caused by any form of stress. The unilateral distribution of the histologic lesions is, in the moderator's experience, a common finding in cases of SDAV infection, as is the history of onset of clinical signs one week to 10 days after arrival to quarantine. The differential diagnosis included cytomegalovirus and papovavirus

(polyoma virus), both of which produce intranuclear inclusions which were not seen in this case. Dacryoadenitis of the Harderian gland can also result from orbital bleeding as a result of venapuncture of the orbital venous plexus for obtaining blood samples (McGee, Maronpot, 1979). In some slides there is a subacute sialoadenitis in a section of salivary gland.

SDAV is a coronavirus which is antigenically related to mouse hepatitis virus (MHV), rat coronavirus, and human coronavirus OC38. Serological titers to SDAV are presently indistinguishable from those to rat coronavirus which causes interstitial pneumonitis in adult rats.

Contributor. Veterinary Sciences Division, Comparative Pathology Branch (VSP), School of Aerospace Medicine, Brooks AFB, Texas 78235.

Suggested reading.

Bhatt, P. N., Jacoby, R. O. and Jonas, A. M.: Respiratory infection in mice with sialodacryoadenitis virus, a coronavirus of rats. Infect. & Immunol. 18(3): 823-827, 1977.

Eisenbrandt, D. L., Hubbard, G. B. and Schmidt, R. E.: A subclinical epizootic of sialodacryoadenitis in rats. Lab. Anim. Sci. 32: 655-659, 1982.

Jacoby, R. O., Bhatt, P. N. and Jonas, A. M.: Pathogenesis of sialodacryodenitis in gnotobiotic rats. Vet. Path. 12: 196-209, 1975.

Jonas, A. M., Craft, J. and Black, C. L.: Sialodacryoadenitis in the rat (a light and electron microscopic study). Arch. Path. 88: 613-622, 1969.

McGee, M. A. and Maronpot, R. R.: Harderian gland dacryoadenitis in rats resulting from orbital bleeding. Lab. Anim. Sci. 29(5): 639-641, 1979.

Percy, D. H., Hanna, P. E., Paturzo, F. et al.: Comparison of strain susceptibility to experimental sialodacryoadenitis in rats. Lab. Anim. Sci. 34: 255-260, 1984.

Smith, A. L.: An immunoflfuorescence test for detection of serum antibody to rodent coronaviruses. Lab. Anim. Sci. 33: 157-160, 1983.

Case II - 83P-227 (AFIP 1946538).

History. Tissue from a 13-year-old female thoroughbred, equine, which exhibited disturbed equilibrium with poor coordination and was unable to sustain weight on left front leg.

Gross Pathology. Soft tissue edema, fluid exudation and mild hyperemia were found in sheath surrounding the left metacarpal ligaments approximated 5 cm distal to joint. A large (11x5x4 cm), off-white nodule was found in the right apical lobe of the lung.

Laboratory Results.

Fecal: Strongylus, 3+ (moderate).
Bacteriology: no pathogens were isolated.
AGID - EIA: negative.

Contributor's Diagnosis & Comment. Granular cell tumor (granular cell myoblastoma) apical lobe of lung, thoroughbred, equine.

This interesting tumor occurs in a variety of species at many anatomical locations.

AFIP Diagnosis. Granular cell tumor, lung, thoroughbred, equine.

Conference Note. Participants were in agreement with a diagnosis of granular cell tumor (formerly granular cell myoblastoma), and all listed oncocytoma as a differential diagnosis. Two different cell types are noted; the more numerous cells are large polyhedral cells with eosinophilic granular cytoplasm (granular cells). Cytoplasmic granules stain variably with PAS and are diastase resistant. The second population is smaller and more spindle-shaped; these cells lie adjacent to vessels. They were thought to be angulate body cells and were shown to contain single to multiple PAS-positive, diastase resistant intracytoplasmic globules which, according to the moderator, correspond to the angulate bodies seen ultrastructurally.

Evidence supporting the theory that the cell of origin of granular cell tumors is a precursor of the Schwann cell is: 1) frequent close anatomical relationship of granular cell tumors to peripheral nerve, 2) presence of substances similar to degradation products of myelin in granular cell tumors, 3) presence of high concentrations of gangliosides and cerebrosides in granular cell tumors, and 4) the histologic similarity between granular cells and Schwann cells near axons undergoing Wallerian degeneration (Parker, Novilla, Brown et al., 1979).

It has been suggested that the intracranial granular cell tumors seen in aging rats may arise from Schwann cells (or a common progenitor cell) of small perivascular nerves in the leptomeninges and central nervous system (Hollander, Burek, Boorman et al., 1976). The demonstration of S100 protein, neurone specific enolase, and two peripheral nerve myelin proteins in rat granular cell tumors, is cited by Sanford, Hoover, and Miller (1984) and provides further evidence for a neural origin of granular cell tumors.

Contributor. Animal Health Laboratory, Maryland Department of Agriculture, 4901 Calvert Road, College Park, Maryland 20740.

Suggested reading.

Berman, J. J., Rive, J. M. and Strandberg, J.: Granular cell variants in a rat schwannoma. Vet. Path. 15: 725-731, 1978.

Hollander, C. F., Burek, J. D., Boorman, G. A. et al.: Granular cell tumors of the central nervous system of rats. Arch. Path. Lab. Med. 100: 445-447, 1976.

Parker, G. A., Novilla, M. N., Brown, A. C. et al.: Granular cell tumor (myoblastoma) in the lung of a horse. J. Comp. Path. 89: 421-430, 1979.

Parker, G. A., Botha, W., Van Cellen, A. et al.: Cerebral granular cell tumor (myoblastoma) in a dog: Case report and literature review. Cornell Vet. 68: 506-520, 1978.

Sanford, S. E., Hoover, D. M., Miller, R. B.: Primary cardiac granular cell tumor in a dog. Vet. Path. 21: 489-494, 1984.

Turk, M.A.M., Johnson, G. C. Gallima, A. M. et al.: Canine granular cell tumor (myoblastoma): A report of four cases and review of the literature. J. Sm. Anim. Pract. 24: 637-645, 1983.

Turk, M.A.M. and Breeze, R. G.: Histochemical and ultrastructural features of an equine pulmonary granular cell tumor (myoblastoma). J. Comp. Path. 91: 471-481, 1981.

Case III - D83-533 (AFIP 1948327) (2 kodachrome slides).

History. Tissue from an adult Holstein cow which was treated for toxic mastitis. She was down the next day, stargazing, with no use of the left front leg. She was eating normally. There was no improvement over a 5-day period.

Gross Pathology. Cervical nerves were firm, 4-5 cm in diameter. Brachial plexus was thickened. C8 has an 8 cm diameter firm mass in the axilla. The cervico-thoracic ganglia are 6x6x8 cm diameter, firm and white. Intercostal nerves are thickened with multiple 2-3 cm nodules. The vagus is 4 cm diameter and epicardial nerves are prominent. Celiac ganglion is 15 cm diameter.

Laboratory Results. CSF was normal.

Contributor's Diagnosis & Comment. Multiple schwannomas (bovine neurofibromatosis), etiology--unknown.

In this section of brachial plexus, multiple nerves are greatly enlarged due to replacement by nodules and interlacing bundles of neoplastic spindle cells. In most areas, the cells are densely packed with scanty extracellular material and are similar to Antoni type A tissue. "Onion bulb-like" structures are prominent in less affected nerve fascicles.

Multiple schwannomas are relatively common benign tumors of cattle. The sites most frequently involved are the brachial plexus, intercostal nerves, and sympathetic nervous system, although other sites, including skin, have been described. The most likely cell of origin is considered to be the Schwann cell, however, the perineurialtosis (von Recklinghausen's disease) of man.

AFIP Diagnosis. Peripheral nerve sheath neoplasm, multiple, brachial plexus (per contributor), Holstein, bovine; condition--compatible with bovine neurofibromatosis.

Conference Note. Tissue sections contain nerve fascicles which ensheath variably-sized neoplastic growths. The largest tumor is a solid cellular mass composed of spindle cells arranged in some interlacing bundles, but otherwise in a random array. More loosely-arranged myxomatous areas with plump round neoplastic cells are seen in some sections. Participants felt the largest tumor is poorly-differentiated, in contrast to surrounding smaller tumors which are also solid cellular masses but in which spindle cells form Verocay bodies and storiform patterns which are suggestive of a well-differentiated tumor of neural origin. Special stains reveal little collagen, little intercellular ground substance, and few if any nerve fibers within the tumor masses. Participants were therefore in agreement with the contributor's diagnosis of multiple schwannomas.

Bovine neurofibromatosis has been compared to von Recklinghausen's disease in man. The latter, however, is a genetically-transmitted phakomatosis and involves numerous organ systems, as opposed to only periphereal nerves in the bovine. Although many similarities do exist between bovine and human neurofibromatosis, the bicolor damselfish has been recently proposed as a more useful animal model (Schmale, Hensley, Udey, 1983).

The diffuse involvement of peripheral nerves in bovine neurofibromatosis has suggested an infectious etiology. The finding of virus-like particles in neoplastic cells of bovine nerve sheath tumors has been reported (Canfield, Doughty, 1980).

Contributor. Department of Pathology, Cornell University, Ithaca, New York 14850.

Suggested reading.

Canfield, P.: A light microscopic study of bovine peripheral nerve sheath tumors. Vet. Path. 15: 283-291, 1978.

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Mitcham, S. A., Kasari, T. R., Parent, J. M. et al.: Intracranial schwannoma in a cow. Can. Vet. J. 25: 138-141, 1984.

Monlux, A. W. and Davis, C. L.: Multiple schwannomas of cattle. Am. J. Vet. Res. 14: 499-509, 1953.

Schmale, M. C., Hensley, G., Udey, L. R.: Neurofibromatosis, von Recklinghausen's disease, multiple schwannomas, malignant schwannomas. Amer. J. Path. 112(2): 238-241, 1983.

Case IV - 81-1810-6 (AFIP 1913616).

History. Incidental finding upon necropsying a castrated male quarterhorse (18 months old) suffering from nonregenerative anemia.

Gross Pathology. Multiple 1-3 mm ulcers on the tongue and gums adjacent to teeth.

Contributor's Diagnosis & Comment. Glossitis, pyogranulomatous, ulcerative with larval stage of flies of the order Diptera (myiasis). Gasterophilus intestinalis infection.

The migrating larvae had a chitinous exoskeleton with spines, striated somatic musculature, body cavity, digestive system and trachea. The burrowing parasite in the tongue is probably Gasterophilus intestinalis which invades the tongue and gums. G. nasalis invades only the gums.

AFIP Diagnosis. Glossitis, ulcerative, subacute, diffuse, moderate, with submucosal arthropod parasites, tongue, quarterhorse, equine, etiology--compatible with Gastrophilus sp.

Conference Note. Most sections examined contain 1-3 larvae within the submucosa, although an occasional larva is present in the mucosa. Some participants felt that the host's inflammatory response was out of proportion to the number of larvae present and speculated that there was another underlying disease in progress. The mucosa contains occasional pustules, possibly migration tracts, and also some plant material.

Although large numbers of mature larvae may be found in the stomach of the horse, perforating ulcers or other gastric disorders which result from attached larvae are uncommon. Esophagitis and laryngitis caused by immature migrating larvae are sometimes seen, and the latter may be one cause of choke in the horse.

The different species of Gastrophilus are most easily identified by examination of the third stage larvae. G. intestinalis is by far the most common in the U.S., and G. hemorrhoidalis is thought to be limited to the Pacific northwest.

Contributor. Department of Pathology, College of Veterinary Medicine, Kansas State University, Manhattan, Kansas 66506.

Suggested reading.

Cheng, T. C.: The Biology of Animal Parasites. W. B. Saunders Co., Philadelphia, 1964, pp 616-619.

Mansmann, R. A., McAllister, E. S., Pratt, P. W. (Eds.): Equine Medicine and Surgery. 3rd Ed., Vol. 1, American Veterinary Publications, Santa Barbara, CA, 1982, pp 73-75.

Shefstad, D. K.: Scanning electron microscopy of Gastrophilus intestinalis lesions of the equine stomach. J. Am. Vet. Med. Assoc. 172: 310-313, 1978.

Soulsby, E.J.L.: Helminths, Arthropods and Protozoa of Domesticated Animals. 7th Ed., Lea & Febiger, Philadelphia, 1982, pp 400-404.

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ADDENDUM:

AFIP Wednesday Slide Con. ___e 1984-1985

Conference 16, Case II

Contrib. #83P-227

AFIP #1946538

Diagnosis: Granular cell tumor, lung, horse.

EM: The cytoplasm of the centrally-located granular cell is filled with numerous pleomorphic lysosomal granules with an outer limiting membrane and a variably membranous, granular or vesicular particulate central substructure. A basal lamina is not evident (possibly due to poor fixation). The other cell surrounded by collagen is probably a fibroblast. (X16,218).

Using 2x2 EM in Comp Path. lecture

Results
AFIP Wednesday Slide Conference - No. 17
30 January 1985

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Case I - 83-781-14 (AFIP 1949058) (1 kodachrome slide).

History. Tissue from an adult (5.32kg) female red-tail boa (Boa constrictor ortonii). The snake went off feed and developed anemia over the summer and eventually died.

Gross Pathology. There was polypoid thickening and reddening of the gastric mucosa was noted.

Contributor's Diagnosis. Stomach, gastritis, hyperplastic/hypertrophic. Cryptosporidiosis.

AFIP Diagnosis. Gastritis, proliferative, subacute, diffuse, moderate, with superficial mucosal protozoa, stomach, red-tail boa, Boa constrictor ortonii, reptile; etiology--compatible with Cryptosporidia sp.

Conference Note. The normal anatomy of the snake stomach was briefly discussed. Within the fundic portion of the stomach, fundic glands are composed of a uniform population single eosinophilic granular cells. These cells elaborate both HCL and pepsinogen precursors, and therefore, perform the tasks of both parietal and chief cells of the mammalian stomach. The snake stomach does not have a squamous portion. In this case, there is hyperplasia of both mucous neck cells and the surface epithelium, with a reduction in fundic glands. Special stains show that the cryptosporidia are involved with mucous neck cells and the non-differentiated surface epithelium. The organisms are best demonstrated with a modified acid-fast stain when recovered from fecal flotation or feces with Sheother's sugar solution or from smears of affected gastric mucosa as depicted in the kodachrome slide. The organisms are not acid-fast positive in tissue sections with conventional acid-fast stains.

Recent studies indicate that two types of cryptosporidia oocysts are formed: a thick-walled oocyst which is passed out in the feces of the host, and a thin-walled cyst. The latter is thought to sporulate endogenously and reinfect the host. It is easy to see how a few infecting organisms can lead to overwhelming infections especially in the immunosuppressed host. The occurrence of cryptosporidiosis as a chronic and usually fatal disease in the snake, characterized by post-prandial vomiting but lack of diarrhea, suggests to Dr. Montali that the affected snakes may be immunosuppressed. The isolation of a retrovirus from boas with cryptosporidiosis and other secondary infections, would add further support that immunosuppressive viruses may underlie many of these opportunistic infections.

Cryptosporidia develop within the unit membrane of the host which forms a parasitophorous vacuole; but since a limiting plate divides the cyst from the cell, the parasite is not truly intracellular. Recent transmission studies support only

one species of Cryptosporidia in mammals; however, it is likely that the forms in ophidians and avians are probably more species-specific. There is currently no evidence of a cycle between rodents and snakes.

Contributor. Pathology Department, National Zoological Park, Washington, DC 20008.

Suggested reading.

Brownstein, J. D., Strandberg, J. D., Montali, R. J. et al.: Cryptosporidium in snakes with hypertrophic gastritis. Vet. Path. 14: 606-617, 1977.

Kirkpatrick, C. E., and Farrell, J. P.: Cryptosporidiosis. The Compendium on Continuing Education #9, 6(3): 154-162, March 1984.

Navin, T. R. and Juranek, D. D.: Cryptosporidiosis: Clinical, epidemiologic, and parasitologic review. Rev. Infect. Dis. 6(3): 313-327, 1984.

Pearson, G. R., and Logan, E. F.: Scanning and transmission electron microscopic observations on the host-parasite relationship in intestinal cryptosporidiosis of neonatal calves. Res. Vet. Sci. 34: 149-154, 1983.

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Case II - 83-779-12 (AFIP 1949062) (1 kodachrome slide).

History. Tissue from a 2-1/2 year old male Bactrian camel (Camelus bactrianus). The camel had a granular wound in the inguinal region and a persistent leukocytosis for about 4 months. There was no response to antibiotic or supportive treatment and the animal was euthanatized.

Gross Pathology. Grossly, white, firm nodules were disseminated throughout internal lymph nodes and parenchymal organs.

Laboratory Results. Mycobacterium bovis was cultured from lung, thoracic lymph nodes, liver and mesenteric lymph nodes at NVSL and verified by guinea pig inoculation.

Contributor's Diagnosis & Comment. Lung, pneumonia, necrogranulomatous. Lung, tuberculosis, Mycobacterium bovis.

AFB were never observed in multiple smears of affected organs in multiple histologic sections of various affected organs stained with Ziehl-Neelsen, Fite-Faraco and Auramine-o-Rodamine.

AFIP Diagnosis. Pyogranulomas, multifocal and coalescing, severe, lung, Bactrian camel, Camelus bactrianus, Camelidae.

Conference Note. Participants noted similarities between the pyogranulomas seen in this case and those typical of caseous lymphadenitis of sheep, including the prominent lamination of the central basophilic, caseous debris. Although these areas of caseous necrosis are surrounded by macrophages, lymphocytes, granulocytes and fibrous connective tissue, only rarely are giant cells seen. These lesions are identical to those described by Elmossalami, Siam, and El Surgany (1971) in their study of M. bovis-induced lesions seen in camels at slaughter.

The severity of lesions in the host is a reflection of the adaptability of that mycobacterial species to that host. Usually, the greater the hypersensitivity of the host to the organism, the more severe the reaction and necrosis will be to the presence of even a few organisms (e.g. Koch's reaction). Camels, like guinea pigs, are extremely sensitive to mycobacteria in contrast to birds in which early in the disease, the lesions often consist of numerous macrophages containing myriads of acid-fast bacilli with minimal reaction. The hypersensitivity of camels to mycobacteria is also reflected in tuberculin testing; many false positive reactions are seen, probably as a result of exposure of these animals to atypical mycobacteria such as M. avium scrofulaceum and kansasii.

The moderator used this case to emphasize the importance of freezing tissue at necropsy. A diagnosis was ultimately based upon culturing M. bovis from lung and lymph nodes, whereas in all of the special stained sections examined only one equivocal mycobacterium was seen.

Interestingly, camels also appear to be very sensitive to isoniazid, an antitubercular drug commonly used for treatment or prophylaxis in humans and other mammals. Isoniazid appears to affect the bone marrow in camels causing severe granulocyto- and thrombocytopenia.

The moderator noted that the tissue in this case could be identified as originating from a camelid due to the eliptical shape of the red blood cells.

Contributor. Pathology Department, National Zoological Park, Washington, D.C. 20008.

Suggested reading.

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Case III - U. of S. Vet. Path. N84-3445 (1947498).

History. This 5-day-old male Pekin duck (Anas platyrhynchos) was inoculated IM at 1 day post-hatching with 0.5 ml 1:10 suspension in phosphate buffered saline plus antibiotics of liver tissue from wild adult female mallard found dead. At 4 days post-inoculation the bird was severely depressed, eyes pasted shut, head tilt, frequent "chewing".

Gross Pathology. The bird was moderately dehydrated. Liver was pale with numerous 0.5-1 mm hemorrhages on the surface and in the parenchyma. Spleen was 4 mm diameter and very dark. Intestine was empty of ingesta, with diffuse hemorrhage in mucosa of cloaca and necrosis about the opening to bursa of Fabricius. Thymic lobules were extremely small (ca. 3mm); (bursa 6 x 3 mm).

Contributor's Diagnosis & Comment. Focal hepatic necrosis with prominent intranuclear inclusion bodies.

Lesions in the original wild duck were highly suggestive of duck plague (duck viral enteritis): focal hepatic necrosis, superficial mucosal necrosis and esophagus and cloaca, hemorrhagic-necrotic lesions over intestinal lymphoid bands. A virus has been isolated, but not yet confirmed as that of duck plague (Anatid herpes virus).

AFIP Diagnosis. Necrosis, multifocal, mild to moderate, with basophilic intranuclear inclusion bodies, Pekin duck, avian.

Conference Note. Three basic changes are present in these sections, and include focal necrosis, hepatocellular vacuolar change, and papillary bile duct hyperplasia. Clear cytoplasmic vacuoles are noted in most hepatocytes and probably represent lipid normally seen in birds less than 1 week of age which are still absorbing yolk. Hepatocellular vacuolar change, however, is severe in association with the necrotic foci.

There was discussion as to whether changes present in bile ducts are artifactual, or a result of the virus. Participants noted inclusion bodies in several of the biliary epithelial cells, and therefore thought the piling up of cells and papilliferous fronds noted in some of the larger radicals are indicative of viral-associated hyperplastic change. Doctor Montali pointed out that the biliary epithelium of ducklings is very sensitive to insult, and that aflatoxin e.g., can produce hyperplasia within 24 hours.

Duck viral enteritis (DVE or duck plague) is caused by a herpes virus which affects only Anseriformes (ducks, geese and swans). Grossly, in a peracute infection, hemorrhage from all orifices may be seen, and prolapse of the penis is common. Disseminated necrosis and hemorrhage may be present in all parenchymatous organs. In the more fully developed disease, raised green plaques (enanthematous lesions) and lymphoid necrosis in the digestive tract are also typical.

Participants discussed other herpetic diseases of birds.

Contributor. Department of Veterinary Pathology, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon S7N 0W).

Suggested reading.

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Leibovitz, L.: Duck plague (duck virus enteritis). Chapt 24, in Diseases of Poultry, 7th Ed., Hofstad, M.S. et al. (eds), Iowa State University Press, Ames, 1978, pp 621-632.

Montali, R. J., Mitchell, B., and Greenwell, G. A.: An epornitic of duck viral enteritis in a zoological park. J. Am. Vet. Med. Assoc. 169(9): 954-958, 1976.
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Case IV - 83-102-1 (AFIP 1910131).

History. Tissue from a mature, male, red bird of paradise. This bird was the father of the only successful breeding in captivity. His daughter, now 2 years old, is also under treatment for the same condition. Clinically, the bird showed poor condition and hepatomegaly. He was treated and although he responded at first, he reverted and died. Grossly, the only lesion noted was an enlarged deep brown liver.

Gross Pathology. The only lesion noted was an enlarged deep brown liver.

Contributor's Diagnoses & Comment. 1) Hemosiderosis, chronic, severe, etiology unknown. 2) Hepatitis, chronic, diffuse, secondary to #1.

Iron containing pigmentation of livers is a common finding in many families of birds. Often the pigmentation is accompanied with liver disease. This disease appears to be particularly common in birds of paradise. Griner (1983) reports 32 of 40 birds of paradise had brown pigment, presumed to be lipofuscin, in the liver. Assink and Frankenhuis sent a comprehensive report on hemosiderosis of the liver in birds of paradise to all zoos housing these species. They point out that most commercial diets have iron contents too high for these species. The Houston Zoo had eliminated all foods with excessively high iron prior to this bird's death. All birds of paradise receiving necropsies have shown this lesion. Most have been associated with severe liver disease. Analysis of available diet constituents has shown reaching low dietary levels of iron recommended by Frankenhuis impossible.

This bird had been treated with iron chelating agents for over a year. At first the response was dramatic but eventually he died. His daughter, the only bird of paradise born in captivity, is now two years old and is slowly dying. She has been treated for over a year. Mynah birds are also susceptible and are being used at the Houston Zoo to develop an implant for slow release of the chelating agents. Hopefully, with more constant blood levels, the treatment will be more successful over the long term.

AFIP Diagnoses. 1) Hepatitis, chronic, diffuse, mild, with diffuse intracytoplasmic (hepatocytes and Kupffer cells) granular pigment, red bird of paradise, avian. 2) Acid fast bacilli, intracellular, diffuse, Kupffer cells, liver.

Conference Note. Participants noted the brown granular pigment is present primarily within hepatocytes although some is seen within Kupffer cells. Special stains confirm the pigment as iron. The lesions are compatible with conditions of excessive iron storage which are commonly seen in birds of paradise, mynah birds, and quetzals. In a study of this condition in mynah birds, Gosselin and Kramer

(1983) report that stainable iron is detectable as early as 10 days after hatching, and that the earliest lesions observed (1 month of age) were hydropic degeneration of hepatocytes with mild periportal fibrosis. They have concluded that this condition is not diet-induced. In African Bantu natives, lesions typical of diet-induced iron overload are characterized by iron deposits within reticuloendothelial cells of the liver, spleen and bone marrow. In contrast, iron deposits in affected exotic birds, and in humans with idiopathic hemochromatosis, are heaviest within hepatocytes. Hepatocellular carcinoma is frequently seen in birds and in humans with high hepatocellular iron concentrations.

In humans with idiopathic hemochromatosis, it has been suggested that defective reticuloendothelial uptake of iron results in high saturation of circulating transferrin; this, in turn, stimulates uptake of iron by parenchymal cells, especially hepatocytes. There is evidence that iron may then produce cellular damage by weakening lysosomal membranes so that acid hydrolases are released into the cytoplasm. This action on the membranes may be the result of the formation of free radicals which then produce lipid peroxidation (Stanbury, Wyngaarden, Fredrickson et al., 1983).

Another finding in this case was numerous acid-fast bacilli in the macrophages that also contained some of the iron pigment. These were confirmed with an Auramine-o-Rhodomine stain with fluorescent microscopy. The identity of the pink fibrillar material which surrounds vessels and radiates out between sinusoids, could not be confirmed as being either collagen or amyloid with special stains. While some participants thought the material to be collagen, the moderator felt that it was characteristic of amyloid which he commonly sees in bird livers particularly in view of the attendant mycobacteriosis.

Contributor. University of Texas Medical School, Comparative Medicine, P.O. Box 20708, Houston, Texas 77025.

Suggested reading.

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Gosselin, S. J., and Kramer, L. W.: Pathophysiology of excessive iron storage in mynah birds. J. Am. Vet. Med. Assoc. 183(11): 1238-1240, 1983.

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Results
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6 February 1985

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Case I - ON83/2380 (AFIP 1950123).

History. 10-week-old Friesian heifer. 16 out of 32 Friesian calves aged 8-14 weeks died over a 4-week period. Clinical signs of anorexia, pale mucus membranes, rapid weight loss, dry harsh coats, coughing, mucopurulent nasal discharge, excess salivation and palpably enlarged superficial lymph nodes were apparent for 7-10 days prior to death. Calves were being raised in old dog runs (dogs removed 3 months prior to use) and being fed milk replacer and crushed oats.

Gross Pathology. Autopsies on 3 calves showed emaciation with mobilization of body fat reserves. There was a generalized lymphadenopathy - lymph nodes enlarged and oedematous. Skeletal muscles were pale and had a mottled appearance. In one calf there was pale streaking of the myocardium. Petechial haemorrhages were seen subpleurally, subendocardially and subcutaneously.

Laboratory Results. Clinically affected calves had a normocytic normochromic anaemia, with P.C.V. as low as 14%.

Contributor's Diagnosis & Comment. Lymphadenitis. Glomerulonephritis. Diffuse subacute interstitial pneumonitis. Sarcocystosis.

Lymph node: Lymphadenitis characterized by lymphoid hyperplasia in the cortex and paracortex. The medullary cords are distended by lymphocytes and plasma cells. Medullary sinuses are oedematous and filled with haemosiderin laden macrophages. Moderate numbers of schizonts of a sporozoan parasite are present.

Kidney: There are multiple foci of mononuclear cell aggregations which are more prominent in perivascular and periglomerular sites in the cortex and between tubules in the renal medulla. Some glomeruli contained proteinaceous material within Bowman's space, while others were undergoing degeneration and necrosis. Proteinaceous exudate and cellular debris is present in some tubules. Small numbers of schizonts are present, usually located in glomeruli.

Lung: A diffuse subacute interstitial pneumonitis with mild thickening of alveolar and interlobular septa due to interstitial oedema and mononuclear cell infiltration. Multifocal haemorrhage into alveoli. Some arterioles and capillaries contained fibrinous microthrombi. A small number of schizonts were found in endothelial cells of blood vessels throughout the lungs.

The gross pathology and histopathology is in keeping with naturally occurring and experimentally produced bovine Sarcosystosis.

AFIP Diagnoses. 1) Protozoal schizonts, endothelial cells, lung, lymph node, kidney, Fresian, bovine. 2) Pneumonitis, subacute, diffuse, mild, with multifocal intra-alveolar hemorrhage, lung. 3) Nephritis, interstitial, subacute, diffuse, mild, kidney; etiology--compatible with *Sarcocystis* sp.

Conference Note. In the lymph node of this case, participants noted that the medullary sinuses are prominent and there is increased cellularity of the paracortex. All, however, agreed that it represents a normal immunoreactive lymph node.

In the differential diagnosis, toxoplasmosis must be ruled out. Unlike Sarcocystis spp, Toxoplasma readily infects parenchymal cells as well as endothelial cells. The lesions of toxoplasmosis are typically more necrotizing than most other protozoal diseases. However, in acute sarcocystosis, diffuse endothelial damage resulting in coagulation disorders (DIC) and hemorrhage may result in widespread necrosis resembling toxoplasmosis. Ultrastructurally, the meronts of Sarcocystis and Toxoplasma can be differentiated in that those of the latter are separated from the host cell cytoplasm by a parasitophorous vacuole; those of the former are within the cytoplasm of the host cell (Dubey, Speer, Epling, 1982). Finally, acute toxoplasmosis is rarely observed in cattle.

A recent study by Frelier and Lewis (1984) has provided some evidence involving Coombs-positive antibodies and complement, with the profound anemia seen in acute sarcocystosis. An excellent review of the life cycle of Sarcocystis of domestic animals was written by Dubey in 1976.

Contributor. Agricultural Research & Veterinary Centre, Forest Road, Orange, N.S.W. Australia 2800.

Suggested reading.

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Case II - BGSM, Dept Comp Med 8120 (AFIP 1947389).

History. Tissue from a 14-year-old, female squirrel monkey (Saimiri sciureus). The animal was discovered weak, dehydrated and hypothermic. It died shortly thereafter.

Gross Pathology. Both kidneys were shrunken, firm and diffusely tan to pale brown with irregular pitted cortical surfaces. The lungs were markedly edematous and the thorax contained approximately 15 ml of light yellow fluid.

Laboratory Results. Results of examination of blood samples drawn immediately prior to the animal's death are as follows: HCT - 28%; sodium - 154 meq/L; potassium - 6.5 meq/L; TSP - 5.2 gm/dl; BUN - 156 mg/dl; creatinine - 2.1 mg/dl.

Contributor's Diagnosis & Comment. Glomerulonephritis, chronic, diffuse, severe, with marked tubular atrophy and interstitial fibrosis.

Renal lesions, principally glomerular changes, are common necropsy findings in adult squirrel monkeys in our colony. Early glomerular changes have been found in animals as young as five months of age. Lesions apparently progress in severity with increasing age and in older animals can lead to secondary tubular damage and death from renal failure. Proteinuria, dehydration and azotemia are found in affected animals and some animals may develop the nephrotic syndrome. Although the etiology is unknown there is a suggestion of a familial predisposition to the development of glomerulonephritis.

AFIP Diagnosis. Glomerulonephritis, membranoproliferative, chronic, diffuse, severe, with secondary tubulo-interstitial lesions, kidney, squirrel monkey, Saimiri sciureus, primate.

Conference Note. Virtually all glomeruli in this case are hypercellular; the increased cell type (endothelial versus mesangial) cannot be distinguished at the light microscopic level. Within most glomeruli, there is an increase in pink homogeneous material and "wire loops" characteristic of membranous thickening are seen around the periphery of many capillary loops, the changes are interpreted as membranoproliferative. Additionally, some glomeruli contain focal areas of parietal epithelial hyperplasia (capping) reminiscent of early crescent formation. Crescents are aggregates of monocytes and hyperplastic parietal epithelial cells which line Bowman's space, sometimes compressing the capillary tuft, and are the hallmark of severe glomerular damage (Robbins, Cotran, Kumar, 1984). Occasional glomerular synechiations were also noted.

Tubular and interstitial changes were considered by participants to be a consequence of the glomerular lesions. The changes include focal tubular dilatation and epithelial degeneration and atrophy. Many tubules contain an amorphous eosinophilic material (proteinaceous). A considerable amount of interstitial, sometimes tubular epithelial, mineralization is present, and hemosiderin pigment is present in diffuse aggregates. Adventitial expansion and thickening of vessel walls (similar to changes seen in hypertension) were also noted.

The Department of Nephropathology found the glomerular changes to be consistent with membranoproliferative glomerulonephritis, and are similar to changes they see in systemic lupus and post-streptococcal glomerulonephritis. They emphasize, however, that accurate assessment of glomerular lesions can only be made on thin, 1-micron sections (not submitted in this case), or on ultrastructural examination.

Renal lesions in squirrel monkeys similar to those seen in this case, were reported by Stills and Bullock in 1981.

Contributor. Department of Comparative Medicine, Bowman Gray School of Medicine, Winston-Salem, North Carolina 27103.

Suggested reading.

Bullock, B. C., and Lehner, N.D.M.: Nephrotic syndrome in cholesterol-fed squirrel monkeys (Saimiri sciureus). Fed. Proc. 31: 652, 1972.

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Ward, P. A.: Evidence for soluble immune complexes in the pathogenesis of the glomerulonephritis of quartan malaria. The Lancet, 283-285, Feb 8, 1969.

Case III - N84-556 (AFIP 1947696).

History. Tissue from a 9-year-old male Golden retriever. This dog had suffered intermittent bilateral epistaxis 6 months prior to presentation. He had been treated with sub-therapeutic doses of tetracycline for 2 months prior to presentation. The dog had been raised in Florida, but had lived in Sicily for 3 years before onset. A diagnosis was rendered on a random skin punch biopsy and bone marrow aspirate. The owner elected euthanasia.

Gross Pathology. The bone marrow was abundant, thick, and very red. There was mild splenomegaly and mesenteric lymphadenopathy. No skin lesions were appreciated grossly.

Laboratory Results. PCV=24%; Total protein=10.0 grams/dl with hyperglobulinemia, WBC=16,700 with mature neutrophilia, Ehrlichia canis titer=1:2,560.

Contributor's Diagnosis & Comment. Dermatitis, superficial, granulomatous, severe. Etiology, Leishmania sp.

The protozoal organisms had a distinct nucleus and kinetoplast and were thought to be most likely Leishmania donovani. Although no skin lesions were noted clinically, organisms were found in skin histiocytes from various parts of the body. Occasional Demodex mites were considered to be incidental in this case, as the inflammation was not centered around hair follicles. The dog also had a multifocal granulomatous hepatitis, splenitis, lymphadenitis, and pneumonia, with organisms in each organ, as well as in bone marrow. No organisms consistent with Ehrlichia canis were discovered. An antemortem diagnosis was made in this case by skin biopsy from the flank, and bone marrow aspirates. Skin lesions and hyperglobulinemia are important findings in diagnosing Leishmania. Phlebotomus sp. are one type of vector.

AFIP Diagnosis. Dermatitis, granulomatous, multifocal to diffuse, mild, with numerous intra-histiocytic protozoal amastigotes, skin, golden retriever, canine.

Conference Note. In these H&E sections, kinetoplasts are difficult to visualize in the intra-histiocytic amastigotes perhaps due to degradative effects of lysosomal enzymes. A Price-Giemsa stain demonstrates the presence of numerous kinetoplasts.

The differential diagnosis included other protozoa with leishmanial (amastigote) stages, namely Trypanosoma cruzi. Although stages of the latter can be seen within macrophages, they more commonly are seen within somatic cells, chiefly myocardial cells. Morphologically the amastigotes of Leishmania and Trypanosoma are virtually indistinguishable to all except those with a lot of comparative experience.

Visceral leishmaniasis, as a chronic disease of man, is known as kala-azar. Various animal breeds are known to be reservoirs of human visceral leishmaniasis in the Mediterranean, China, and South America. In the moderator's experience, dogs have been implicated in all forms of leishmaniasis, including the cutaneous, visceral, and mucocutaneous forms. One focus of endemic canine leishmaniasis has been reported in an Oklahoma kennel where dogs had not traveled outside the United States (Anderson, Buckner, Glenn et al., 1980).

Leishmania spp. have a digeneic life cycle during which they assume extracellular flagellated forms in the alimentary tract of the insect vector and obligate intracellular amastigote forms within macrophages of the spleen, liver, and bone marrow of the mammalian host.

There are indications that tubulin and perhaps actin are present in membranes of L. donovani. It is possible that host antibody is directed against these elements in the parasite, and that this antibody also reacts with the same elements in host cells (Pateraki, Portocala, LaBrousse et al., 1983).

Contributor. Department of Comparative & Experimental Pathology, College of Veterinary Medicine, University of Florida, Gainesville, Florida 32610.

Suggested reading.

Anderson, D. C., Buckner, R. G., Glenn, B. L.: et al.: Endemic canine leishmaniasis. Vet. Path. 17: 94-96, 1980.

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Keenan, C. M., Hendricks, D., Lightner, L. et al.: Visceral leishmaniasis in the German shepherd dog. I. Infection, clinical disease, and clinical pathology. Vet. Path. 21: 74-79, 1984.

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Pateraki, E., Portocala, R., LaBrousse, H. et al.: Antiactin and antitubulin antibodies in canine visceral leishmaniasis. Infect. & Immun. 42: 496-500, 1983.

Robbins, S. L., Cotran, R. S., and Kumar, V.: Pathologic Basis of Disease, W. B. Saunders Co., Philadelphia, 1984, pp 371-373.

Case IV - XMC2029 Lilly Res Labs (AFIP 1948730).

History. Tissue from a 300g female Sprague-Dawley rat that was given a single oral gavage dose of 20 mg of dimethylbenzanthracene at 6-8 weeks of age. Within 6 months, mammary tumors developed. The rat was then given an experimental compound.

Gross Pathology. At necropsy, multiple firm white nodules were present within lung and liver and there were multiple mammary masses. Other similarly treated rats had only mammary tumors without visceral lesions.

Contributor's Diagnosis & Comment. Mast cell tumor, visceral.

Liver and lung contained multiple, poorly circumscribed nodules composed of moderately large polygonal to stellate cells. The cells had round to oval medium-sized, open-faced nuclei and abundant cytoplasm containing brightly eosinophilic granules. The granules were metachromatic when stained with toluidine blue. Mitotic figures were moderately numerous. Electron microscopy demonstrated secretory granules that were bounded by thin membranes and contained finely

granular matrices and occasionally, small, tight whirls. (The rodent mast cell granule does not contain well-formed, membranous scrolls that are often seen in nonrodents.)

Cutaneous or intestinal mast cell tumors were not observed. The mast cell tumor was felt to be an incidental finding, not related to treatment with either DMBA or the experimental compound.

Other lesions included mononuclear infiltrates of peribronchial areas and portal triads and a suppurative bronchiolitis associated with a pulmonar tumor.

AFIP Diagnoses. 1) Mast cell tumor, lung, Sprague-Dawley rat, rodent. 2) Bronchopneumonia, pyogranulomatous, subacute to chronic, diffuse, severe, with bronchiectatic abscesses, lung; etiology--suggestive of Mycoplasma pulmonis infection.

Conference Note. Epithelial hyperplasia is present in many of the ectatic bronchioles. Numerous plasma cells, some of which contain Russell bodies, are present in the lung parenchyma surrounding the tumors.

Tumor cells in various areas of the tumor contain numerous granules which stain with Luna mast cell stain, but equivocally with Giemsa. The fact that these granules are variably eosinophilic with H&E is unusual for mast cell granules. The paucity of eosinophils in this tumor is unusual for most mast cell tumors, as granular constituents include an eosinophil chemotactic factor. Additionally, histamine has been shown to be chemotactic for eosinophils, if only mildly.

Mast cell tumors, rare in rats, are more common in other domestic species. In dogs and cats they are associated with gastric hyperacidity and gastroduodenal ulceration. This is in part due to histamine type II receptors on gastric parietal cells causing hyperstimulation and resulting hyperchlorhydria, and to the deletereous effects of mast cell proteolytic enzymes on the walls of vessels in the stomach and other organs.

Contributor. Lilly Research Labs, P.O. Box 708, Greenfield, Indiana 46140.

Suggested reading.

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Moulton, J. E. (Ed.): Tumors in Domestic Animals. Second Edition, University of California Press, Berkeley, pp 26-33.

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Results
AFIP Wednesday Slide Conference - No. 19
13 February 1985

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Case I - 84-0001 (AFIP 1949421).

History. Tissue from a 23-month-old male Fischer 344 rat. This animal was in the control group on a 2-year chronic toxicity-oncogenicity study and was sacrificed in a moribund condition.

Gross Pathology. Multiple yellow-tan nodules, 2 mm or less in diameter were present on the parietal and visceral peritoneum, with the most extensive involvement occurring in the scrotal sac. There were also multiple pale masses noted in both testicles which were 2-5 mm in diameter.

Contributor's Diagnoses & Comment. Mesothelioma, tunica vaginalis propria. Leydig cell tumor, testes, Fischer 344 rat.

In our laboratory, naturally-occurring mesotheliomas have been observed in approximately 3.6% of the male Fischer 344 rats on oncogenicity studies. Mesotheliomas appear to arise from the serosal surface of the testes/epididymides and have a rather characteristic shaggy-granular appearance. These tumors frequently extend into the abdominal cavity and affect the visceral and parietal peritoneum with the accumulation of dark ascitic fluid. Tumors histologically appear as dense accumulations of mesothelial cells or papillary structures covered by a single layer of neoplastic mesothelial cells. Small tumors are not infrequently seen in random sections of testes and epididymides which grossly appeared normal and must be differentiated from atypical mesothelial proliferations. The pathogenesis of this naturally-occurring tumor is unknwon, however, audioradiographic studies of rat mesothelium with [^{3}H] thymidine have demonstrated an increase incorporation of the radioactive label in mesothelium covering the testis as compared to other sites.

Interstitial cell tumors of the testis were also present and are observed in almost all Fischer rats in long-term studies in our laboratory.

AFIP Diagnoses. 1) Interstitial (Leydig) cell tumor, testis, Fischer 344 rat, rodent. 2) Atrophy, seminiferous tubule, diffuse, moderate, testis. 3) Mesothelioma, tunica vaginalis, testis.

Conference Note. The atrophy of the seminiferous tubules which surround the large interstitial cell tumor (ICT) was thought by participants to be due to the pressure from tumor expansion. Correspondingly, many tubules contain pink granular material thought by most to be normal secretory products which have accumulated within the tubules due to compression of the tubule and blockage of the outflow.

Some slides contain additional sections of testicle in which small foci of interstitial cell hyperplasia occasionally coalesce to form a larger nodule which would be termed an adenoma by some. The moderator pointed out that in the opinion of some workers, the interstitial cell hyperplasia becomes an adenoma when the size of the nodule exceeds the size of a normal seminiferous tubule.

ICT is a common finding in older F344 rats; commonly, there will be unilateral involvement, with atrophy of the contralateral testicle. ICT in the rat is often a functional neoplasm, and participants speculated that contralateral atrophy could be accomplished through negative feed mechanisms stemming from increased testosterone, or due to the direct effects on the contralateral testicle of a metabolite of testosterone--estrogen.

Mesotheliomas arising from the tunica vaginalis are also seen with variable incidence in different strains of rat. Occasionally, they extend into the abdominal cavity and are responsible for a brown fluid which fills the abdomen. Abdominal mesotheliomas may strangulate the intestines.

ICT must occasionally be differentiated from tumors of adrenal rests; this may be difficult histologically and ultrastructurally due to numerous similarities. The latter usually occurs on the surface of the spermatic cord or in the region of the rete, but very rarely in the substance of the testis (Mostofi, Bresler, 1976).

Contributor. Dow Chemical Co., Mammalian and Environmental Toxicology Research Laboratory, 1803 Building, Midland, Michigan 48640.

Suggested reading.

Berman, J. J., and Rice, M. M.: Mesotheliomas and proliferative lesions of the testicular mesothelium produced in Fischer, Sprague-Dawley and Buffalo rats by Methyl(acetoxymethyl)nitrosamine (DMN-OAc). Vet. Path. 16: 574-582, 1979.

Goodman, D. G., Ward, J. M., Squire, R. A. et al.: Neoplastic and nonneoplastic lesions in aging F344 rats. Toxicol. & Appl. Pharmcol. 48: 237-248, 1979.

Mostofi, F. K., and Bresler, V. M.: Tumours of the testis. In Pathology of Tumours in Laboratory Animals, Vol. I, Part 2, International Agency for Research on Cancer, Lyon, 1976, pp 135-150.

Turusov, V. S. (Ed.): Pathology of Tumours in Laboratory Animals, Vol. II - Tumours of the Mouse. International Agency for Research on Cancer, Lyon, 1979, pp 333-338.

Case II - 4-232-34E (AFIP 1962597).

History. Tissue from a 5-year-old female beagle. This moderately overweight animal was a control dog in a toxicity study. The findings were incidental at necropsy. Modified Knott's test was negative.

Gross Pathology. The thyroid, containing diffuse miliary white spots, was firm and slightly enlarged. Scattered foci of possible lymphoid hyperplasia were noted in the spleen. One adult female Dirofilaria immitis was found in the right ventricle and 4 adult females and 1 adult male in the pulmonary artery. The right A.V. valve was thickened.

Laboratory Results. Over 6 months of biweekly bleeding for CBC and SMAC, most parameters remained within normal ranges. There was intermittent eosinophilia (up to 8%) and basophilia (up to 2%) cholesterol levels consistently ranged from 201-245 mg/dl.

Contributor's Diagnoses & Comment. 1) Thyroiditis, lymphoplasmacytic, chronic, disseminated, moderate to severe, thyroid gland. 2) Arteriosclerosis, early, multifocal, mild to moderate, trabecular arteries, spleen.

Familial lymphocytic thyroiditis has been reported in numerous colonies of laboratory beagles. The majority of the animals are asymptomatic though occasional animals display the classic clinical signs of hypothyroidism including obesity, thinned alopecic skin, heat seeking activity, and varying degrees of hyperlipidemia. In our colony, the overall incidence of thyroiditis in those dogs examined appears to be 10-15% with a relatively high incidence of hyperplastic and benign neoplastic lesions in affected animals. In this study, the incidence was even higher. Out of a total of 24 animals in the study, 9 were found to have lymphoid or lymphoplasmacytic thyroiditis of variable severity; of these, 5 also had mild arteriosclerotic lesions. Blood lipid levels range from normal in animals with histologically severe lymphocytic thyroiditis to consistent levels near 400 mg/dl in animals with mild thyroid lesions. Chronic high level of circulating blood lipid are attributed to a net decrease in lipid catabolism in the hypothyroid animal and can lead to severe systemic atherosclerosis. In our animals arteriosclerotic lesions have been demonstrated only in the spleen. The relatively mild lesions noted in the splenic arteries of this animal may be related to chronic low grade hyperlipidemia. It is interesting to speculate what lesions might have occurred over time in this animal.

AFIP Diagnoses. 1) Thyroiditis, interstitial, lymphocytic (Hashimoto's-like disease), diffuse, moderate, with follicular atrophy, thyroid, beagle, canine. 2) Branchial cyst (on some microslides only), focal, perithyroidal connective tissue.

Conference Note. Splenic arteriosclerosis diagnosed by the contributor was not present in slides examined by participants. Some splenic arteries, however, contain pale laminated areas interposed between muscular (medial) layers; this was thought by some participants to be elastosis. The presence of numerous megakaryocytes scattered throughout the spleen was thought to be normal in a dog of this age (5 yrs).

Unlike the disease in laboratory beagles, lymphocytic thyroiditis in pet dogs of various breeds is accompanied by characteristic and sometimes severe clinical manifestations of hypothyroidism. Thyroiditis in the beagle has many important similarities to Hashimoto's disease (HD), to include a peak incidence in middle-aged adults, and antibodies directed toward thyroglobulin, a second colloid antigen, and a microsomal antigen. Decreased efficacy of suppressor T-lymphocytes has been thought to play a role in the disease. Due to these and other similarities, the laboratory beagle is an animal model for HD (Gosselin, Capen, Martin, 1978).

In a recent study by Aichinger, Fill, and Wick (1985), it has been shown that the thyroid gland is not only the target, but is probably also intimately involved in the production of autoantibodies. They have demonstrated the expression of Class II (HLA-DR) antigen by thyroid epithelial cells in human patients with HD. Class II histocompatibility antigens are normally only seen on antigen-presenting

cells (macrophages, dendritic cells, lymphocytes). Their presence on thyroid epithelial cells of patients with HD suggests these cells are instrumental in promoting autoantibody production by plasma cells within the gland, and are probably also instrumental in inducing cytotoxic T-cells (Rose, 1985).

Spontaneous forms of thyroiditis are also commonly seen and studied in the obese strain of leghorn chicken and the Buffalo rat.

Contributor. Division of Veterinary Medical Research, FDA, Agricultural Research Center, Beltsville, Maryland 20705.

Suggested reading.

Aichinger, G., Fill, H., and Wick, G.: "In situ" immune complexes, lymphocyte subpopulations, and HLA-DR positive epithelial cells in Hashimoto thyroiditis. Lab. Invest. 52(2): 132-140, 1985.

Fritz, T. E., Zeman, R. C., and Zelle, M. R.: Pathology and familial incidence of thyroiditis in a closed beagle colony. Exper. & Molec. Path. 12: 14-30, 1970.

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Haines, D. M., Lording, P. M., and Penhale, W. J.: Survey of thyroglobulin autoantibodies in dogs. Am. J. Vet. Res. 45(8): 1493-1497, 1984.

Manning, P. J.: Thyroid gland and arterial lesions of beagles with familial hypothyroidism and hyperlipoproteinemia. Am. J. Vet. Res. 40(6): 820-828, 1979.

Manning, P. J., Corwin, L. A., and Middleton, C. C.: Familial hyperlipoproteinemia and thyroid dysfunction of beagles. Exper. & Molec. Path. 19: 378-388, 1973.

Rose, N. R.: Editorial: The thyroid gland as a source and target of autoimmunity. Lab. Invest. 52(2): 117-119, 1985.

Wright, J. R., Senhauser, D. A., Yates, A. J. et al.: Spontaneous thyroiditis in BB Wistar diabetic rats. Vet. Path. 20: 522-530, 1983.

Case III - 8-223-80 (AFIP 1953401).

History. Tissue from an adult beaver (Castor canadensis). Multiple deaths occurred in one stream drainage yet no clinical signs seen.

Gross Pathology. An adult beaver was examined. There was moderate postmortem autolysis. The liver contained multiple small pale foci of random distribution. No other significant gross lesions were seen.

Laboratory Results. Cultures of the liver resulted in the isolation of a gram-negative, aerobic bacillus on blood cystine agar. Subsequent biochemical tests confirmed the isolate to be Francisella tularensis.

Contributor's Diagnosis & Comment. Hepatic necrosis, acute, multifocal, severe. Francisella tularensis.

Tularemia is a plague-like disease affecting a variety of animals and man. Previous reports from Montana have appeared in the literature (Hammersland, Jones, Child, 1940) (Jellison, Kohl, Butler et al.).

AFIP Diagnosis. Hepatitis, necrotizing, acute, multifocal, liver, beaver, Castor canadensis, rodent.

Conference Note. Participants thought the walls of some veins adjacent to foci of necrosis were necrotic, often with associated thrombi. The discussion centered around the differential diagnosis which included infectious and toxic agents. Most agreed that a toxin would affect the same portion of each liver lobule, whereas the distribution of lesions in this case is random. Infectious etiologies could include Francisella, Yersinia spp, viral agents (herpes & reoviruses), Salmonella and Bacillus piliformis. In some infections (Yersinia and Tyzzer's disease) bacteria are usually readily seen. The others could be difficult to differentiate histopathologically. The amount of karyorrhectic debris present in necrotic foci was thought by most participants to exceed what would be present from dissolution of hepatocyte nuclei alone; most thought the debris included fragments of inflammatory cells.

A study by the moderator (Moe, Canonico, Stookey et al., 1975) suggested that the ability of the host to mount a rapid cell-mediated immune response is paramount in the outcome of Francisella infections; the development of pyogranulomatous lesions was thought to be required to trigger the humoral response. In animals unable to develop cell-mediated immunity rapidly enough, like the beaver in this case, survivability was low. A recent study by Sandstrom and co-workers (1984) suggests that the bacterium must first multiply within macrophages before effective neutralizing antibodies can be produced by immunocytes.

Transmission of tularemia is somewhat unusual in that it may be accomplished via insect vectors (and transtadially within these), via water, or via aerosol. Some sources report infection through intact human skin.

Contributor. Montana Veterinary Diagnostic Laboratory, Department of Livestock, Marsh Laboratory, P.O. Box 997,. Bozeman, Montana 59771.

Suggested reading.

Bell, J. F., and Reilly, J. R.: Tularemia. In Infectious Diseases of Wild Mammals, Chapt 18. Iowa State University Press, Ames, pp 214-231.

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Hammersland, H. L., and Joneschild, E. M.: Tularemia in a beaver. Clinical Data, 96-97, Jan 1940.

Jellison, W. L., Kohls, G. M., Butler, W. J. et al.: Epizootic tularemia in the beaver, Castor canadensis, and the contamination of stream water with Pasteurella tularensis. Am. J. Hyg. 36: 168-182, 1942.

Sandstrom, G., Tarnvik, A., Wolf-Watz, H. et al.: Antigen from Francisella tularensis: Nonidentity between determinants participating in cell-mediated and humoral reactions. Infect. & Immun. 45(1): 101-106, 1984.

Case IV - R-1169-81 (AFIP 1946348) (2 kodachrome slides).

History. Tissue from a 17-month-old male Sprague-Dawley rat.

Gross Pathology. Lesion involving the right external ear canal and right side of head. Mass measured 4x4x3 cm and on cut surface consisted mainly of yellowish friable material. Occasional cystic spaces were present.

Contributor's Diagnosis. Adenoma, auditory sebaceous gland (Zymbal's gland tumor).

AFIP Diagnosis. Carcinoma, Zymbal's gland, Sprague-Dawley rat, rodent.

Conference Note. There is variation between tumor sections in this case. In some, the tumor is primarily sebaceous, it is well-circumscribed by a thin fibrous capsule, and the mitotic rate is low. In other sections the neoplasm is predominantly squamous, there is no visible capsule around the mass, the mitotic rate is in excess of 12 in some high power fields, and some neoplastic epithelial cells can be seen invading the surrounding mesenchyme. The malignant character of this tumor, at least in some portions, is supported by the gross photographs which depict invasion, ulceration and hemorrhage at the base of the ear. Within large cystic areas of the tumor are variable numbers of inflammatory cells, some bacterial colonies, and keratinaceous debris.

Tumors of Zymbal's gland are rare in the rat accounting for 1% of spontaneous neoplasms in this species. Mixed sebaceous and squamous neoplasms of the rat may also arise from preputial and clitoral glands. One conference participant reported seeing spontaneous tumors of Zymbal's gland in mice on several occasions.

Contributor. Department of Pathology, Smith Kline & French Laboratories, 1500 Spring Garden Street, P.O. Box 7929, Philadelphia, Pennsylvania 19101.

Suggested reading. Pliss, G. B.: Tumors of the auditory sebaceous glands. In Pathology of Tumours in Laboratory Animals, Turusov, V. S. (Ed.), International Agency for Research on Cancer, Lyon, 1973, pp 23-30.

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Results
AFIP Wednesday Slide Conference - No. 20
20 February 1985

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Case I - 84-406 (AFIP 1947706).

History. Tissue from an adult female Long-Evans rat. The animal was pregnant when shipped and pupped 7 days after arriving from the vendor. One of the 14 pups died at age 2 days. Dam and pups appeared healthy until 5 days after pupping at which time the dam became lethargic, ataxic, dyspneic, and would not nurse her pups. She had a reddish nasal and ocular discharge.

Gross Pathology. The lungs were diffusely consolidated with widespread 1-3 mm tan-white foci. The liver had a pale mottled appearance. No other gross lesions were seen.

Laboratory Results. Samples of lung were cultured and Corynebacterium kutscheri was isolated.

Contributor's Diagnosis & Comment. Pneumonia, diffuse, caseopurulent, subacute, severe. Pleuritis, fibrinous, subacute, moderate, etiology--Corynebacterium kutscheri.

Special stains revealed gram positive, acid fast negative, long rod shaped bacteria (larger colonies did not stain well).

The random, diffuse, coalescing foci of inflammation suggest hematogenous spread of the organism to the lung which is considered the likely route of entry in pulmonary infections. No primary source of infection could be found however. The gross appearance of the liver corresponded histologically to central lobular congestion and periportal hepatocellular vacuolation.

Overt disease arising from latent infections have been associated with conditions lowering the host's resistence. In this case shipping, pregnancy, and/or the subsequent nursing of 13 pups likely aided in exacerbating a latent infection. Based on the degree of fibroplasia and type 2 cell hyperplasia seen in some areas, it is speculated that the earliest inflammation began at least 4-6 days prior to sacrifice (at or near the time the rat pupped).

A list of differential etiologies would include bacteria causing septicemia (Pseudomonas, Salmonella) or possibly those causing bronchopneumonia (Streptococcus, Pasteurella).

AFIP Diagnosis. Pneumonia, necrosuppurative, chronic, multifocal and coalescing, moderate, with numerous intralesional bacterial colonies, and diffuse mild pleuritis, lung, Long-Evans rat, rodent; etiology--compatible with Corynebacterium kutcheri.

Conference Note. Some participants preferred a diagnosis of granulomatous or pyogranulomatous pneumonia; most, however, reserve granulomatous for inflammatory processes involving predominantly macrophages, unlike this case. One participant noted that the multiple aggregates of neutrophils resemble fairly old abscesses in that they are surrounded by macrophages, fibroblasts, and fibrous connective tissue (although scant). Finally, participants noted mild phlebitis of several pulmonary veins within some sections.

The features of latency involving the "A" strain of the bacterium, and subsequent induction of active infection involving the "K" strain, have not been thoroughly elucidated. Some authors feel that stress merely enhances conditions for bacterial proliferation within target organs which have been seeded during latent infections. Others feel that during active infections, the target organs (liver, lung, kidney) filter out blood-borne virulent (K) bacteria more efficiently than other organs, and are therefore affected most severely. The source of bacteremia is not known, but at least one author feels the colon and mesenteric veins may be involved, particularly in mice (Weisbroth, Scher, 1968).

Contributor. Pfizer Central Research, Eastern Point Road, Groton, Connecticut 06340.

Suggested reading.

Benirschke, K., Garner, F. M., Jones, T. C. (Eds.): Pathology of Laboratory Animals, Vol. I, Springer-Verlage, New York, 1978, pp 89-90, 251-252, 1396-1397.

Ford, T. M., and Joiner, G. N.: Pneumonia in a rat associated with Corynebacterium pseudo tuberculosis. A case report and literature survey. Lab. Anim. Care 18: 220-223, 1968.

Giddens, W. E., Keahey, K. K., Carter, G. R. et al.: Pneumonia in rats due to infection with Corynebacterium kutscheri. Path. Vet. 5: 227-237, 1968.

Reddy, C. A., and Kao, M.: Distribution of cytochromes in selected species of corynebacteria pathogenic to animals. J. Gen. Microbiol. 128: 2379-2383, 1982.

Weisbroth, S. H., and Scher, S.: Corynebacterium kutscheri infection in the mouse. I. Report of an outbreak, bacteriology, and pathology of spontaneous infections. Lab. Anim. Care 18: 451-458, 1968.

Case II - 83-3909 (AFIP 1948304).

History. Tissue from a 2-year-old male Arab cross equine. The horse was dopey, anorexic and was losing weight rapidly. It was treated with antibiotics, vitamins and steroids with no improvement and was euthanatized after approximately one month. Grossly, the liver was pale and firm and slightly reduced in size.

Laboratory Results. Liver copper wet weight was 45 ppm. Lead--background levels. Brain was negative for rabies and no significant bacteria were isolated.

Contributor's Diagnosis & Comment. Hepatic fibrosis periportal, bile duct hyperplasia and hepatocyte megalocytosis due to pyrrolizidine alkaloid toxicoses. In this case, believed to be by Tansy ragwort (Senecio jacobaea).

Acute poisoning by pyrrolizidine alkaloids rarely occurs naturally as the plants are unpalatable and animals do not consume enough for acute toxicity. Horses and pigs appear to be more susceptive than cattle and sheep. Fibrosis generally is much more marked in cattle than in horses. In this case megalocytosis is very marked with some cells being many times the normal size. The nuclear membrane is accepting the basic dye very strongly and the chromatin is fragmented. The nucleoli are single and very large. The megalocytosis is thought to be due to an inhibition of mitosis although the synthesis of DNA is normal. This results in disrupted regeneration of hepatocytes with increase in size instead of division.

This case came from the northern part of the Province from which we also recive cases of Alsike Clover poisoning, (Trefolium hydridum), however, in this poisoning hepatocyte necrosis does not occur and megalocytosis is not a feature. Although in the early stages of Alsike poisoning bile duct hyperplasia does occur in the later stages periportal fibrosis is a feature.

Pyrrolizidine alkaloids have been demonstrated to cause lesions in young receiving the toxin through the milk. Spongy degeneration of the CNS has been demonstrated in P.A. poisoning.

AFIP Diagnosis. Cirrhosis, diffuse, moderate to severe, with multifocal mild to moderate periportal hepatitis, and diffuse megalocytosis, liver, Arab-cross, equine; etiology--compatible with pyrrolizidine alkaloid toxicity.

Conference Note. The diagnosis of cirrhosis implies the presence of four major lesions: hepatocellular necrosis, bridging portal fibrosis, nodular hepatocellular regeneration, and biliary ductal hyperplasia. All are present in this case, as is a variable amount of bile stasis.

Pyrrolizidine alkaloids (PA) are converted by hepatocellular (as well as other cells) microsomal enzymes to metabolites including reactive alkylating agents--pyrroles. The latter have an affinity for negatively charged molecules, many of which are in the nucleus; they have the capacity to bind and cross-link strands of DNA, but for some reason, DNA synthesis proceeds. Studies with monocrotaline, a PA found in Crotalaria spp, have shown that one of its pyrrole metabolite is capable of binding sulfhydryl groups of tubulin, a component of the mitotic spindle. This results in the inability to form a mitotic spindle. The result is the formation of megalocytes. Participants noted that cells and nuclei of hepatocytes within regenerative nodules are of normal size; it stands to reason that only cells unaffected by PA would be free to divide. In addition, monocrotaline metabolites inhibit plasma membrane sodium-potassium ATPase and other sulfhydryl containing membrane components, resulting in cell swelling and death. Finally, it is believed that PA metabolites are complete carcinogens through their alkylation of cellular DNA, RNA and protein. (Allen, Robertson, Johnson et al., 1979).

Hepatic encephalopathy may result from the inability of a severely damaged liver to catabolize aromatic amino acids allowing their ratio to increase in relation to the branched chain amino acids which are catabolized at a normal rate by muscle. Imbalance of amino acids causes, at least in theory, an imbalance in certain neurotransmitters. Elevated levels of ammonia may also play a role in hepatic encephalopathy (Pearson, 1984).

The effects of PA are not limited to the liver, as they may be metabolized by cells in the kidney, lung, and elsewhere.

Contributor. British Columbia Veterinary Laboratory, B.C. Ministry of Agriculture & Food, P.O. Box 100, Abbotsford, B.C., V2S 4N8, Canada.

Suggested reading.

Allen, J. R., Robertson, K. A., Johnson, W. D. et al.: Toxicological effects of monocrotaline and its metabolites. Proc. Symposium, Oregon State University, 1979, pp 37-42.

Garrett, B. J., Holtan, D. W., Cheeke, P. R. et al.: Effects of dietary supplementation with butylated hydroxyanisole, cysteine, and vitamins B on tansy ragwort (Senecio jacobaea) toxicosis in ponies. Am. J. Vet Res. 45(3): 459-464, 1984.

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Gulick, B. A., Liu, I.K.M., Qualls, C. W. et al.: Effect of pyrrolizidine alkaloid-induced hepatic disease on plasma amino acid patterns in the horse. Am. J. Vet. Res. 41(11): 1894-1898, 1980.

Johnson, A. E., and Molyneux, R. J.: Toxicity of threadleaf groundsel (Senecio doublasii var longilobus) to cattle. Am. J. Vet. Res. 45(1): 26-31, 1984.

Johnson, A. E., and Smart, R. A.: Effects on cattle and their calves of tansy ragwort (Senecio jacobaea) fed in early gestation. Am. J. Vet. Res. 44(7): 1215-1219, 1983.

Pearson, E. G.: Pyrrolizidine alkaloid liver toxicosis in domestic animals. Proc. Second Annual Form & 12th Annual Scientific Program, American College of Veterinary Internal Medicine, Washington, D.C., May 1984, pp 110-120.

Case III - S11961 (AFIP 1955904).

History. Tissue from a mature Hampshire ewe which exhibited sudden onset of weakness progressing to collapse, recumbency and convulsion. It died during examination. The oral mucous membranes were pale and icteric, with slow capillary refill.

Gross Pathology. At necropsy icterus was diffuse throughout body and hemoglobinuria was noted.

Laboratory Results.

Serum Cu = 3.63 ppm	Normal = .75 - 1.40 ppm
Liver Cu = 380 ppm	Normal = 5 - 50 ppm

Contributor's Diagnosis & Comment. Centrilobular hepatocytic necrosis, triadal fibrosis, bile stasis. Etiology: Copper poisoning, (intravascular hemolysis).

The mechanism of copper toxicity most probably involves free radical production. Copper is taken up by hepatocytes and concentrate in lysosomes. Being a transitional metal, it can donate or accept single electrons as it changes valence. These single unpaired electrons can combine with O_2 to form super oxides or hydrogen peroxide, forming the hydroxyl radical. These free radicals can cause lipid peroxidation of lysosomal membranes and subsequently lysosomal enzyme release and cellular necrosis.

AFIP Diagnoses. 1) Necrosis, hepatocellular, individual cell, multifocal to diffuse, mild to moderate, with lobular condensation, liver, Hampshire, ovine. 2) Bile stasis, moderate, diffuse, liver. 3) Vacuolar change, hepatocellular, diffuse, mild, liver. 4) Hepatitis, centrolobular and periportal, subacute, diffuse, mild, liver.

Conference Note. Participants noted that hepatic lobules are small, indicating hepatocellular loss which has resulted in collapse of the lobules. Bile duct hyperplasia is also present in most portal areas, although good ductules are not formed. Variably-sized globular eosinophilic bodies are present within hepatocytes and also within sinusoids. The identity of these globules could not be determined, but they are reminiscent of cytoplasmic condensations (Mallory bodies) seen in hepatocytes and sinusoids of human alcoholics.

Rhodanine stain, which has recently been shown to be a very sensitive indicator of tissue-bound copper (Johnson, Gilbertson, Goldfischer et al., 1984) failed to demonstrate copper in the liver in this case. The Department of Histochemical

Pathology was also unable to demonstrate copper through the use of other special stains and scanning electron microscopy. The Department of Hepatic Pathology stated that, although copper could not be demonstrated in this case, the lesions are in keeping with a metal poisoning. They further cited several cases of Wilson's disease in which tissue-bound copper could not be demonstrated.

Participants questioned serum and liver copper levels from this case and normal levels cited by the contributor. According to some sources (Smith, Jones & Hunt) (Jubb and Kennedy), the copper levels from this case are not abnormal; levels cited by Buck, Van Gelder and Osweiler (1976) do, however, support the contributor's figures, assuming that copper levels in this case were determined from wet liver samples (not stated by the contributor).

Most participants thought that the more chronic changes in this liver were probably due to another toxin, most likely a plant toxin, and that the more recent changes could be due to copper. It has been thought that previous liver damage by hepatotoxic plants may result in excessive copper accumulation in the liver, followed by a fatal hemolytic crisis. A recent study by White, Swick, and Cheeke, (1984) fails to support that theory.

A paper by Sternlieb (1980) discusses effects of excessive copper which are very similar to those caused by PA metabolites, to include interference with tubulin and subsequent spindle formation. Mild hepatocellular megalocytosis seen in this case, may reflect those changes. Additionally, Sternlieb reports deposition of Mallory's hyalin, as in this case, in the hepatocytes in various conditions in which there is a great excess of hepatic copper; these changes may once again be related to the effect of copper upon tubulin.

Contributor. Merck Sharp & Dohme Research Labs, West Point, Pennsylvania 19486.

Suggested reading.

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Johnson, G. F., Gilbertson, S. R., Goldfischer, S. et al.: Cytochemical detection of inherited copper toxicosis of Bedlington terriers. Vet. Path. 21: 57-60, 1984.

Sternlieb, I.: Copper and the liver. Gastroenterol. 78: 1615-1628, 1980.

Van Gelder, G. A. (Ed.): Copper-Molybdenum. In Clinical and Diagnostic Veterinary Toxicology, 2nd Ed., Kendall/Hunt Publishing Co., Dubuque, Iowa, 1976, pp. 297-309.

White, R. D., Swick, R. A., and Cheeke, P. R.: Effects of dietary copper and molybdenum on tansy ragwort (Senecio jacobaea) toxicity in sheep. Am. J. Vet. Res. 45(1): 159-161, 1984.

Wilhelmsen, C. L.: An immunohematological study of chronic copper toxicity in sheep. Cornell Vet. 69: 225-232, 1979.

Case IV - 85-1 (AFIP 1948310).

History. Tissue from an adult male Fischer rat. This mid-dose male rat was found dead on day 531 of a chronic feeding study with a 2.5 cm diameter mass of the caudoventral abdomen.

Gross Pathology. Mass, 2.5 cm diameter, anterior to penis.

Contributor's Diagnosis & Comment. Preputial gland carcinoma. The subcutaneous mass consisted of solid nests, duct-like structures, and cords of epithelial cells in a desmoplastic stroma. The tumor cells are pleomorphic, squamous in character, and showed vesicular nuclei. Mitotic figures are numerous. The duct-like structures contained keratin and cell debris admixed with inflammatory cells. Accumulations of lymphoid cells are focal and multiple. In some sections, tumor emboli are evident in adjacent blood vessels.

AFIP Diagnosis. Carcinoma, preputial gland (per contributor), Fischer rat, rodent.

Conference Note. The preputial and clitoral glands, like Zymbal's gland, are compound holocrine branched tubuloalveolar glands. Acinar cells are sebaceous and all ducts are lined by stratified squamous epithelium. Tumors arising from preputial or clitoral glands are squamous, as in this case, sebaceous, or a combination of the two. Due to their location, they must be differentiated from mammary gland neoplasms. Combined glandular and squamous patterns, such as in this case, are common in preputial gland carcinomas and would be uncommon in a mammary neoplasm. A feature of epithelial cells of preputial glands is the abundance of eosinophilic cytoplasmic granules, not evident in this case. However, in sections stained with H&E at the AFIP, these granules are evident in many tumor cells. Finally, some participants thought that the combination of adenocarcinoma and solid (comedo) carcinoma patterns would be unusual in a mammary gland tumor of the rat. A large cystic duct within the tumor in many sections, was thought by the moderator to represent a pre-existing preputial gland duct; these tend to become cystic in older animals. Numerous elements of normal mammary gland, with epithelial cells containing a brown pigment, are present around or have been incorporated into the tumor.

Preputial gland tumors are uncommon in the rat with an incidence of less than 5% as spontaneous neoplasms. Their incidence can increase drastically due to the effects of chemical carcinogens.

Contributor. Bio/dynamics, Inc., Department of Pathology, Mettlers Road, East Millstone, New Jersey 08873.

Suggested reading.

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Results
AFIP Wednesday Slide Conference - No. 21
27 February 1985

Conference Moderator: Sidney R. Jones, DVM PhD
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Case I - HLA-2 (AFIP 1899058.

History. Tissue from a 16-year-old spayed female mix-breed canine. The dog was presented with a 3-day history of anorexia, polydipsia, polyuria, and vomiting. Physical examination revealed a temperature of 100°F (37.7°C), pulse rate of 180 beats/minute and respiration characterized by panting. Mucus membranes were pale with a capillary refill time greater than 2 seconds. Dehydration was estimated at 7-8%. The dog responded favorably to treatment of renal insufficiency, but relapsed and was euthanatized one week later.

Gross Pathology. The abdominal cavity contained 3-4 liters of fluid. The kidneys appeared shrunken. The liver contained multiple 3 mm diameter yellow foci scattered throughout the surface and parenchyma.

Laboratory Results. Abnormal serum chemistries included a BUN of 121 mg/dl and creatinine of 5.8 mg/dl.

Contributor's Diagnosis & Comment. Liver: Multifocal parasitic granulomas. Hepatic capillariasis, Capillaria hepatica.

The liver sections contained multiple circumscribed lesions characterized by a thick connective tissue wall surrounding large numbers of ova, necrotic debris and mineralized material which results in artifactual knife marks in many sections. The ova were typical trichurid eggs with prominent bipolar plugs. Hepatic capillariasis was reported as an incidental finding. The diagnosis may also be confirmed with impression smears of unfixed lesions. Some slides also contain a section of kidney with severe diffuse chronic glomerulonephropathy.

Capillaria hepatica infection of the liver of dogs may be observed as an incidental finding during abdominal surgery or at the time of necropsy. Infection with this nematode parasite has been observed in mice, rats, cats, dogs, beavers, muskrats, hares, pigs, gerbils, ground squirrels, rabbits, peccaries, nonhuman primates and man.

The major host is the wild rat with infection being rare in the dog. Although infection is inapparent in these species, it may cause hepatitis and death in nonhuman primates and has been associated with severe hepatic fibrosis and disordered liver function in man.

The adults of Capillaria hepatica live in the liver of various mammalian species with wild rats being the major host. Unembryonated eggs are produced by the nematode in the liver where they are retained. Eggs reach the environment only through the decay of an infected carcass or when they are discharged in the feces

of carnivorous animals feeding on infected mammals. Eggs become infective in two to six weeks following exposure to air. Infection results from ingestion of embryonated eggs from the soil. Eggs hatch in the cecum and larvae penetrate the mucosa and reach the liver via the portal vein. Larvae mature into adult worms within the liver in approximately three weeks and subsequently degenerate releasing large numbers of eggs into the liver parenchyma.

AFIP Diagnoses. 1) Hepatitis, subacute, multifocal to diffuse, mild, with multifocal adventitious cysts containing nematode eggs, liver, mixbreed, canine; etiology--compatible with Capillaria hepatica. 2) Glomerulonephritis, chronic, diffuse, with tubulointerstitial changes, kidney.

Conference Note. Parasite eggs released into the parenchyma of an organ are initially walled off within a granuloma. The end stage of such granulomas may leave the parasite eggs encircled only by a fibrous capsule as is present in this case. Cysts formed by the host in response to foreign bodies, parasites, etc. may be called adventitious cysts.

The eggs in this case range from 60 to 90 microns in length and 25-30 microns in width; in some sections, they can be seen to be bioperculate. The egg wall contains numerous striations which are characteristic of Capillaria hepatica. Participants discussed the life cycle of this parasite.

Some microslides contain a section of kidney as well as liver; although the former is not a focus of interest in this case, the changes are compatible with an immune mediated glomerulonephritis. A variable number of plasma cells are present in the cortical interstitium and cortical tubules contain, and are sometimes distended by, pink homogeneous material. Additionally, a chronic pyelitis is present in some sections.

Contributor. Hazleton Laboratories, Inc., 9200 Leesburg Turnpike, Vienna, Virginia 22180.

Suggested reading.

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Solomon, G. B., and Grigonis, G. J., Jr.: Capillaria hepatica: Relation of structure and composition of egg shell to antigen release. Exp. Parasitol. 40: 298-307, 1976.

Soulsby, E.J.L.: Helminths, Arthropods and Protozoa of Domesticated Animals. Lea & Febiger, Philadelphia, 1982, p. 340.

Case II - 84-0002 (AFIP 1949426).

History. Tissue from a 25-month-old female Fischer 344 rat. This animal was in the control group on a 2-year toxicity-oncogenicity study and was sacrificed while in apparent good health at the termination of the study.

Gross Pathology. A firm, multilobulated, centrally necrotic, circumscribed mass measuring approximately 4 cm in diameter was located at the junction of the body of the uterus and cervix.

Contributor's Diagnosis & Comment. Malignant schwannoma, uterus, Fischer 344, rat.

Nonepithelial tumors of the uterus are common in Fischer 344 rats. The majority of the tumors are small, originate in the uterine horns, benign and are classified as endometrial stromal polyps. This tumor is atypical in that it was large, localized to the body of the uterus/cervix and was malignant. Significant features of this tumor were nuclear palisading, interlacing of parallel bundles of cells and marked nuclear pleomorphism characterized by giant cells with multiple nuclei and abnormal mitosis. The differential diagnoses included malignant schwannoma, stromal sarcoma and leiomyosarcoma.

AFIP Diagnosis. Sarcoma, undifferentiated, uterus, F344 rat, rodent.

Conference Note. The differential diagnosis included endometrial stromal sarcoma, leiomyosarcoma, malignant schwannoma, and malignant fibrous histiocytoma. Some participants thought this tumor represented a fairly uncomplicated leiomyosarcoma except for occasional areas where tumor cells become rounded which would be unusual for malignant smooth muscle cells. Participants thought the tumor lacked the fibrous character which is typical of malignant fibrous histiocytoma. Most participants were in agreement with a diagnosis of endometrial stromal sarcoma.

The Department of Immunochemistry was able to demonstrate the presence of S-100 protein in most tumor cells and, based upon that finding and the histologic appearance of the tumor, they concurred with the contributor's diagnosis of malignant schwannoma. The Department of Neuropathology failed to see any patterns suggesting a neural origin in this tumor. Further, they did not feel that the S-100 positivity of cells was typical of the degree of staining they commonly see in schwannomas.

S-100 protein, formerly thought to be neural-specific, is now known to also be found in numerous non-neural tissues (Weiss, Langloss, Enzinger, 1983). Recently, several different types of S-100 proteins have been elucidated (Takahashi, Isobe, Ohtsuki et al., 1984).

Malignant schwannomas have been described in the uteri of mice (Stewart, Deringer, Dunn et al., 1974) and in the dorsal spinal nerve root of a laboratory rat (Abbot, 1982), but not in or associated with the rat uterus. Much more commonly, endometrial stromal sarcomas and leiomyosarcomas arise from the rat uterus, and have the same general appearance as the tumor in this case, to include the numerous multinucleated giant cells. Differentiation of the two may be difficult without special immunochemical stains such as for the intermediate filament "desmin" found in muscle. However, differentiation may be academic, since often the neoplasms will represent an incidental finding at necropsy as in this case.

Contributor. Dow Chemical Company, Mammalian & Environmental Toxicology Research Laboratory Bldg., Midland, Michigan 48640.

Suggested reading.

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Weiss, S. W., Langloss, J. M., and Enzinger, F. M.: Lab. Invest. 49(3): 299-308, 1983.

Case III - 10419-84 (AFIP 1946396). (2 kodachrome slides included).

History. Tissue from a 1-year-old female domestic shorthair cat. The cat was obtained as a kitten from the Humane Society. At 6 months of age it was taken to the veterinarian to be spayed. The cat was icteric and the veterinarian refused to spay the cat. Six months later it began losing weight and was still jaundiced. The owners refused treatment and the cat was killed.

Gross Pathology. The liver showed micronodular cirrhosis in all lobes, with broad scars on the surfaces of some lobes. The hilus of the liver was fibrosed to the pancreas and the duodenum. Common bile duct and all extrahepatic bile ducts showed marked dilation with very thin walls.

Laboratory Results. Lab results at time of euthanasia:

Alanine aminotransferase	1215 U/L (25-75)
Alkaline phosphatase	379 U/L (8-94)
Total bilirubin	12.5 mg/dl (0.0-0.7)
RBC	7.77×10^6
WBC	11.5×10^3 (65 segs, 31 lymphs, 1 mono, 3 eos)

Contributor's Diagnosis & Comment. The tissue was characterized by pseudolobules of more-or-less uniform size. The pseudolobules were isolated and surrounded by thick scar tissue septae. Small bile ducts permeated all septae. This pathology is characteristic of biliary cirrhosis. In this cat the biliary cirrhosis was secondary to chronic extrahepatic bile duct obstruction. The cause of the extensive fibrosis around the common bile duct, duodenum and pancreas could not be determined at necropsy.

Tissue sections stained with rubeanic acid revealed numerous hepatocytes with copper-containing granules. Atomic absorption analysis revealed a copper level of 2,500 parts per million on dry weight basis. This value is compared to a normal hepatic copper concentration of 60-70 ppm DW (Center, Baldwin, King et al., 1983). The excess copper is secondary to chronic bile duct obstruction.

AFIP Diagnosis. Cirrhosis, diffuse, severe, liver, domestic shorthair, feline.

Conference Note. Although conference participants were in agreement that the liver of this cat is cirrhotic, there was discussion about the pattern of cirrhosis. The nodules of hepatocytes rarely contain either a central vein or any portal structures. Some participants thought the nodules are being so severely constricted by the encircling fibrous connective tissue bands that the central vein is obscured by compression. Others thought the nodules were purely regenerative and would therefore contain no preexisting structures.

The Department of Hepatic Pathology diagnosed micronodular biliary type cirrhosis. They commented that the lesions do not represent "reverse lobulation" (central to central linkage, characteristic of congestive cardiac cirrhosis). The disease process started as and has progressed beyond portal fibrosis and bridging.

Based upon guidelines set by Anthony, et al. (1978), the nodules present in the micronodular pattern of cirrhosis are less than 3 mm in diameter, are regular in size relative to one another, generally lack any normal anatomical relationships, and are seen relatively early in the course of the disease. Etiologies of this type of cirrhosis include biliary obstruction, alcoholism, and hemochromatosis. Other patterns of cirrhosis are macronodular and mixed.

Cholestatic hepatic diseases in the cat include neoplastic, parasitic and infectious conditions, cholelithiasis, congenital malformations, hepatic lipidosis, and a poorly defined syndrome of cholangiohepatitis (Center, Baldwin, King, et al. 1983).

Contributor. College of Veterinary Medicine, University of Missouri, Columbia, Missouri 65211.

Suggested reading.

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Richardson, D. C.: Sclerosing cholangitis in a cat. J. Am. Vet. Med. Assoc. 182(7): 710-712, 1983.

Stromeyer, F. W., and Ishak, K. G.: Nodular transformation (nodular "regenerative" hyperplasia) of the liver. Human Path. 12(1): 60-71, 1981.

Case IV - HLA-1 (AFIP 1899158).

History. Tissue from a 94-week-old female CD-1 mouse which was a control from a chronic dietary study found dead at 88 weeks.

Gross Pathology. A 1.8 x 1.6 x 1.2 cm mass involved the muscle and surrounding tissue on the left side of the head.

Contributor's Diagnosis & Comment. Hardian gland carcinoma.
This Harderian gland carcinoma had invaded the brain.
In this 2-year chronic study, eyes examined from terminally sacrificed control animals demonstrated the following incidence of Harderian gland neoplasms.

	Male	Female
Number of animals with eyes examined	31	41
Harderian gland adenoma	2 (6.4%)	2 (4.9%)
Harderian gland carcinoma	0 (0%)	1 (2.4%)

AFIP Diagnosis. Adenocarcinoma, Harderian gland, head, CD-1 mouse, rodent.

Conference Note. The Harderian gland is a horseshoe-shaped lobulated tubuloalveolar lacrimal gland located within the orbit. The gland has a single excretory duct which opens at the base of the nictitating membrane. Spontaneous neoplasms of this gland have been reported as incidental findings in mice, rats, hamsters and rabbits. Until recently the function of the gland was thought to be the production of oily secretion that lubricates the surface of the eye and nictitating membrane. Recent findings suggest a link between this gland and a retinal-pineal-gonadal axis which may indicate the Harderian gland is a source of pheromones (Foster, Small, Fox, 1982).

The Harderian gland can be identified by the presence of porphyrins and both normal and neoplastic cells contain characteristic cytoplasmic lipid droplets.

Well-circumscribed adenomas are more common, accounting for 5-6% of spontaneous tumors of mice, while the adenocarcinomas account for about 1%.

Contributor. Hazleton Laboratories, Inc., 9200 Leesburg Turnpike, Vienna, Virginia 22180.

Suggested reading.

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Results
AFIP Wednesday Slide Conference - No. 22
13 March 1985

Conference Moderators: COL George D. Imes, Jr.
LTC John M. Pletcher
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Case I - 83-2671 (AFIP 1957380).

History. Tissue from an 18-month-old Nguni bull (bovine). Two out of ten Nguni cattle had alopecia with chronic skin lesions. Repeated skin scrapings at weekly intervals were negative for parasites. Weekly dipping ceased 3 weeks prior to clinical examination and had no effect on the skin lesions.

Gross Pathology. The lesions were chronic in nature. There was thickening of the skin with dry scaly areas of alopecia, especially around eyes, dewlap, forelegs, flanks, thighs and the escutcheon area. Alopecia was less marked over the shoulder area but the skin was also dry, scaly, and thickened. The nasal mucosa contained numerous 1/2 mm diameter cysts that were easily visible to the naked eye and easily palpable inside the nostril.

Contributor's Diagnosis & Comment. Dermatitis, nonsuppurative with numerous protozoal cysts, subacute, diffuse, moderate, skin, bovine. Besnoitia besnoiti. Besnoitia besnoiti is a cyst-forming sporozoan with a 2-host life cycle. It causes a chronic, debilitating, and occasionally fatal disease in cattle, horses, and burros. The disease has both cutaneous and systemic manifestations. Rabbits are experimentally susceptible, and similar organisms have been seen in blue wildebeest, impala, and kudu.

When an intermediate host ingests the oocysts, the organisms invade numerous cell types producing tachyzoites that invade fibroblasts and produce large cysts that are filled with numerous bradyzoites. The cyst has an acellular wall which is encapsulated by dense fibrous connective tissue and it contains fibroblasts that have been greatly expanded by proliferating bradyzoites. Nuclei of these fibroblasts are moved to the periphery of the cell where they are flattened and compressed against the inner surface of the acellular wall of the cyst.

Grossly skin invaded by these cysts appears thickened and rugose, and the cysts which may be up to 2 mm in diameter are easily seen with the naked eye. Histologically numerous large spherical Besnoitia besnoiti cysts are present in the dermis which is usually infiltrated with mononuclear inflammatory cells while the epidermis is moderately thickened and somewhat hyperkeratotic.

AFIP Diagnosis. Dermatitis, granulomatous, diffuse, mild to moderate, with numerous large intracellular protozoal cysts, skin, Nguni, bovine, etiology--compatible with Besnoitia spp.

Conference Note. In some histologic sections, there is follicular keratosis with a small number of intrafollicular bacteria. Some participants noted slight thickening of the epidermis due to mild hyperkeratosis. Special stains demonstrate that the thick hyaline walls of the protozoal cysts are composed of fibrous connective tissue. The walls stain weakly with PAS and the bradyzoites within the cysts are strongly PAS positive.

Some facets of the life cycle of Besnoitia spp. are still unclear. The conference moderators have had some experience with besnoitiosis as an endemic disease in native African cattle. The disease there is serious and has warranted the development of a vaccine. In one early cycle of the disease, tachyzoites replicate in host endothelial cells much like Sarcocystis spp.; it is this phase which is associated with severe clinical signs (especially anasarca), and survivors are then subject to the chronic debilitating form of the disease. In this case, several participants noted small intracellular cysts in dermal blood vessels, possibly within endothelial cells. Although Soulsby (1982) and Kreier (1977) list the cat as the definitive host for B. besnoitia, participants questioned whether cats alone could support the widespread endemic disease seen in Africa. It was speculated that other animals might serve as definitive hosts as well.

Contributor. Veterinary Research Institute, Onderstepoort, South Africa.

Suggested reading.

Cheema, A. H., and Toofanian, F.: Besnoitiosis in wild and domestic goats in Iran. Cornell Vet. 69: 159-168, 1979.

Frenkel, J. K.: Besnoitia wallacei of cats and rodents: With a reclassification of other cyst-forming isosporoid coccidia. J. Parasitol. 63(4): 611-628, 1977.

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Soulsby, E.J.L. (Ed.): Helminths, Arthropods and Protozoa of Domesticated Animals. Lea & Febiger, Philadelphia, 1982, pp 686-688.

Terrell, T. G., and Stookey, J. L.: Besnoitia bennetti in two Mexican burros. Vet. Path. 10: 177-184, 1973.

Case II - V84-754 (1947839).

History. Tissue from a 13-year-old male African lion (Panthera leo). Four days prior to this animal's death he was noticed to be off feed. The day before his death the animal was observed to be depressed and dyspneic. He died the next day when he was immobilized for examination.

Gross Pathology. Marked icterus and moderate generalized muscle atrophy were evident. A moderate amount of clear yellow fluid was present in the thoracic and abdominal cavities. The liver was moderately swollen and was brown with a fine yellow reticulated pattern evident throughout the parenchyma. The lungs were moderately reddened and were firmer than normal. Numerous 1-2 mm in diameter dark red foci were evident throughout the parenchyma of all lung lobes. The spleen was engorged with blood.

Laboratory Results. A CBC was done on a blood sample drawn just prior to the animal's death. The results were as follows:

WBC = 11.0 x 10^3 WBC/ul
Hemoglobin = 8.3 g/dl
Hct = 27.2%
Segmented neutrophils 34%
Band neutrophils 57%
Lymphocytes 7%
Monocytes 2%
Platelet estimate - 1-3 per o.i.f. (low)

Contributor's Diagnoses & Comment. 1) Acute interstitial and microfocal pyogranulomatous pneumonia. 2) Acute focal pulmonary hemorrhage. 3) Subacute focal granulomatous and necrotizing hepatitis. Etiology--Salmonella sp. (Group D).

Our differential diagnosis after microscopic examination of the tissues included FIP, toxoplasmosis, and systemic salmonellosis. Tests on an antemortem serum sample (collected just prior to the animals death) and an unfixed postmortem liver specimen revealed the following:

FeLV test - negative
FIP titer - negative
Toxoplasmosis titer - negative
Serum electrophoresis - mildly elevated gamma globulin (gamma glob. = 2.1 g/dl)
Aerobic culture of liver - Salmonella sp. isolated. The Salmonella was nonmotile and thus could not be serotyped.

AFIP Diagnoses. 1) Pneumonia, interstitial, pyogranulomatous, diffuse, severe, with multifocal necrosis and hemorrhage, lung, African lion, Panthera leo, feline. 2) Hepatitis, necrogranulomatous, multifocal, moderate, liver. 3) Degeneration and lipoidal change, hepatocellular, centrolobular to diffuse, mild to moderate, with canalicular bile stasis, liver.

Conference Note. In the lung and especially the liver, megakaryocytes are present. In the liver, numerous nucleated red blood cells are present along with other erythrocyte precursors, indicative of extramedullary hematopoiesis. Hyperplasia of type II pneumocytes is present diffusely throughout the lung. One participant noted that hyperplasia of these cells almost always accompanies interstitial pneumonia. Focal discrete areas of pulmonary hemorrhage and necrosis are suggestive of microinfarcts; some participants reported seeing fibrinous thrombi within septal capillaries. Within the liver, degeneration and piecemeal necrosis of hepatocytes leaves hepatic cords disrupted. An occasional mitotic figure is seen in hepatocytes indicating to some participants that a substantial amount of necrosis has taken place. Random hepatic necrogranulomas in this case were not thought by many participants to be typical typhoid nodules. In some species, calves for instance, these hepatic lesions of salmonellosis may be nothing more than foci of coagulative necrosis in which the organism can often be seen.

Although Salmonella spp. are invasive, the invasion is superficial and is followed by multiplication and production of enterotoxins. These toxins are similar to the enterotoxins produced by E. coli and Vibrio cholerae in that they stimulate intestinal crypt cell adenylate cyclase which results in excessive secretion into the lumen leading to diarrhea and dehydration (Greene, 1984).

Septic pulmonary thrombophlebitis, which may have been present in the lung of this lion, has been reported and is evidently a feature of S. enteritidis infection of hamsters (Innes, Wilson, Ross, 1956).

Contributor. New Mexico Veterinary Diagnostic Services, 700 Camino de Salud, Albuquerque, New Mexico 87106.

Suggested reading.

Freeman, B. A.: Textbook of Microbiology. Chapt 19, W. B. Saunders Co., 1985, pp 464-477.

Greene, C. E.: Clinical Microbiology and Infectious Diseases of the Dog and Cat. Chapt 38, W. B. Saunders Co., 1984, pp 617-623.

Innes, J.R.M., Wilson, C., and Ross, M. A.: Epizootic Salmonella enteritidis infection causing septic pulmonary phlebothrombosis in hamsters. J. Infect. Dis. 98: 133-141, 1956.

Koo, F.C.W., Peterson, J. W., Houston, C. W. et al.: Pathogenesis of experimental salmonellosis: Inhibition of protein sysnthesis by cytotoxin. Infect. & Immun. 43(1): 93-100, 1984.

Timoney, J. F., Neibert, H. C., and Scott, F. W.: Feline salmonellosis. Cornell Vet. 68: 211-219, 1978.

Case III - 83/1653 (AFIP 1950116).

History. Tissue from a 12-month-old Hereford x Friesian steer, bovine. The mob of 32 steers had been grazing an irrigated pasture in the southern Riverina district of New South Wales during late winter. As the subject animal was found dead, no clinical signs were observed.

Gross Pathology. The autopsy was performed on the property and the submitting veterinarian described the following: good body condition, blood-stained frothy material about the mouth and external nares, congestion of subcutaneous tissues, enlarged friable liver and severely enlarged congested pulpy spleen with numerous capsular ecchymotic haemorrhages.

Laboratory Results. Impression smears of the spleen, when stained with polychrome methylene blue, revealed numerous capsulated organisms with a morphology consistent with Bacillus anthracis.

Contributor's Diagnoses & Comment. 1) Septicemic Bacillus anthracis infection. 2) Acute bacterial hepatitis. 3) Acute bacterial splenitis. 4) Intravascular coagulopathy. 5) Acute segmental fibrinohemorrhagic peritonitis.

There is a well-defined "anthrax belt" in the state of New South Wales extending along the near western plains. We frequently see the septicemic form of the disease in sheep and cattle and occasionally, the pharyngeal and intestinal forms in pigs and cattle, respectively. The septicemic form is usually diagnosed on the basis of peripheral blood smears and we very rarely receive material for histological examination.

In the present case the liver and spleen contained numerous septic emboli consisting of large bacilli with truncated ends, displaying no sporulation and often occurring in chains. Further evidence of septicemia was provided by mild periacinar congestion in the liver, severe congestion and hemorrhage in the spleen,

hepatic neutrophilia, serous hepatitis and fibrin thrombi in the sinusoids of both the liver and spleen.

Two characteristics of Bacilus anthracis favor pathogenicity. The capsule, whose major component is polyglutamic acid, blocks the host's defenses by preventing phagocytosis. In addition, the bacteria elaborate a toxin with three components, factors I, II, and III, which increases capillary permeability and presumably initiated intravascular coagulation in this case. Late in the course of the disease, systemic effects of the toxin are leukocytosis and increases in blood potassium, chloride and phosphate together with hypoglycemia and lowering of blood sodium, calcium and cholinesterase.

AFIP Diagnoses. 1) Congestion, diffuse, severe, with lymphoid necrosis and hemorrhage, and myriads of bacilli, spleen, Holstein Fresian cross, bovine. 2) Thrombosis, multifocal, mild, with myriads of bacilli, liver; etiology--compatible with Bacillus anthracis.

Conference Note. It was generally agreed that the presence of red blood cells in the splenic white pulp which surrounds central arterioles constitutes hemorrhage. Differentiation of anthrax bacilli from postmortem contaminants (often Clostridia spp.) can pose a problem although the contaminants are said to be larger, plumper, and more robust. Anthrax bacilli are said to be squared "box-car-shaped" bacilli, although in tissue sections their ends may be rounded. Due to the presence of numerous intrasinusoidal fibrinous thrombi, participants speculated that disseminated intravascular coagulopathy (DIC) may have played a major role in this animal's death. Scattered inflammatory cells in the liver were considered normal background for the bovine.

The three fragments of the anthrax toxin alluded to by the contributor, are also known as edema factor (EF), protective antigen (PA), and lethal factor (LF); none is toxic alone. It has recently been shown that EF is an adenylate cyclase which is activated when it enters the eukaryotic cell. A proposed model envisions PA reacting with host cell receptors causing changes (perhaps allosteric) which allow EF and LF to enter the cell. In the cytoplasm EF is activated when it reacts with a heat-stable substance, probably ceruloplasmin. Cyclic AMP formed by the activated EF leads to the edematous response characteristic of the disease (Freeman, 1985). It has been postulated that death is attributable to respiratory distress resulting from fluid loss into the lung, and to circulatory embarrassment due to pressure from fluid loss into the mediastinum (Ezzell, 1984). The anthrax toxin differs from enterotoxins of cholera, E. coli, and Salmonella which activate host cell cyclase, in that anthrax toxin EF is itself a cyclase. Virulence, in addition to toxin formation, is partially dependent on the formation of a glutamyl polypeptide capsule by the anthrax bacillus (Freeman, 1985).

Incubator areas for anthrax are regions with alkaline soil, high nitrogen levels caused by decaying vegetation, and temperature in excess of 15.5°C. Dwarf and possibly other swine have an unusual and effective defense mechanism against the spores of B. anthracis in that spores do not readily germinate and are rapidly cleared from these animals, even following massive challenge (Walker, 1967).

Contributor. Regional Veterinary Laboratory, New South Wales Department of Agriculture, Private Mail Bag, Wagga Wagga, NSW 2650, Australia.

Suggested reading.

Ezzell, J. W., Ivins, B. E., and Leppla, S. H.: Immunoelectrophoretic analysis, toxicity, and kinetics of in vitro production of the protective antigen and lethal factor components of Bacillus anthracis toxin. Infect. & Immun. 45(3): 761-767, 1984.

Freeman, B. A.: Textbook of Microbiology. Chapt 27, W. B. Saunders Co., 1985, pp 564-570.

Nungester, W. J. (Chairman): Proc. of the Conf. on Progress in the Understanding of Anthrax. Fed. Proc. 26(5): 1485-1571, 1967.

O'Brien, J., Friedlander, A., Dreier, T. et al.: Effects of anthrax of toxin components on human neutrophils. Infect. & Immun. 47(1): 306-310, 1985.

Van Ness, G. B.: Ecology of anthrax. Science 172: 1303-1307, 1971.

Walker, J. S., Klein, F., Lincoln, R. E. et al.: A unique defense mechanism against anthrax demonstrated in dwarf swine. J. Bacteriol. 93(6): 2031-2032, 1967.

Young, J. B.: Epizootic of anthrax in Falls County, Texas. J. Am. Vet. Med. Assoc. 167(9): 842-843, 1975.

Case IV - RWM-B 8-84 (AFIP 1947392). (1 kodachrome slide included).

History. Tissue from an 18-year-old female domestic shorthair, feline. The cat was presented to the treating clinic because of a prolonged digestive disturbance.

Gross Pathology. The liver was tan colored, slightly enlarged and was diffusely granular. The abdominal lymph nodes were enlarged. The lymph nodes had multifocal white areas, which when cut were firmer than the surrounding tissue.

Laboratory Results.
WBC - 23,000: HCT -24%; BUN - 140 mg; Creatinine; Total protein - 7.3; Albumin - 2.91; SGOT - 115; SGPT - 169; Globulin - 4.4; FeLeuk - Negative.

Contributor's Diagnosis & Comment. Bile duct carcinoma, liver, domestic shorthair, feline.

Bile duct carcinoma (cholangiocellular carcinoma) is an uncommon tumor in both man and domestic animals. In the feline, it is considered to be a relatively rare tumor. In one study (Patnaik, 1975) spanning eleven years and 3,145 necropsies, no intrahepatic bile duct carcinomas were reported although 2 extrahepatic bile duct carcinomas were reported.

AFIP Diagnosis. Cholangiocarcinoma, liver, domestic shorthair, feline.

Conference Note. In areas unaffected by the neoplasm, the liver is cirrhotic and lobules are being constricted by encircling bands of fibrous connective tissue. In some lobules, central veins are present, while absent in others. Variably-sized lymphoid infiltrates are present in portal areas and bile duct proliferation is diffuse. Some participants thought that these lesions were compatible with the second or third stage of chronic lymphocytic cholangitis of cats as described by Prasse, Mahaffey, DeNovo, et al. in 1982.

Additionally, a bile duct papillary cystadenoma is present in most sections. Participants speculated that the disease in this cat progressed from cholangitis or cirrhosis, which stimulated bile duct proliferation, to cystadenoma and eventually

to cholangiocarcinoma. Cells lining the cystadenoma do not pile up and their mitotic rate is low in contrast to surrounding carcinomatous cells which are rapidly dividing and piling up in some places.

While neoplasms of the biliary tree are rare in man and domestic animals, carcinomas of both the intra- and extrahepatic biliary tree have been reported in the cat. Interestingly, clonorchid infection of the biliary tract of man is associated with a high incidence of neoplasia of that tissue. Clonorchis infection has also been related with biliary neoplasia in the dog and cat making this single causal agent responsible for tumorigenesis in three different species (Moulton, 1978).

Contributor. Division of Pathology, HFF-100, Center for Food Safety and Applied Nutrition, FDA, 200 C Street S.W., Washington, DC 20204.

Suggested reading.

Barsanti, J. A., Higgins, R. J., Spano, J. S. et al.: Adenocarcinoma of the extrahepatic bile duct in a cat. J. Small Anim. Pract. 17: 599-605, 1976.

Moulton, J. E. (Ed.): Tumors in Domestic Animals. 2nd Ed., University of California Press, 1978, pp 279-281.

Patnaik, A. K., Liu, S. K., Hurvitz, A. I. et al.: Nonhematopoietic neoplasms in cats. J. Natl Cancer Inst. 54(4): 855-860, 1975.

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Results
AFIP Wednesday Slide Conference - No. 23
20 March 1985

Conference Moderator: Charles G. McLeod, Jr.
LTC, VC, USA
Diplomate ACVP
Chief, Comparative Pathology
US Army Medical Research Institute of Chemical Defense
Aberdeen Proving Ground, Edgewood, MD 21010

Case I - 84/2000 (AFIP 1956094).

History. Tissue from a five-month-old lamb. This clinically normal lamb was sent for slaughter and passed the routine antemortem inspection.

Gross Pathology. Postmortem examination revealed several papules, 3-6 mm in diameter, on the tongue. No other gross abnormalities were detected.

Contributor's Morphologic Diagnosis & Comment. Subacute multifocal glossitis with epithelial ballooning degeneration, intraepithelial pustules, bacterial colonies and intracytoplasmic inclusion bodies.

Etiology, pox virus with secondary bacterial infection.

Name of disease; contagious ecthyma.

Although lesions of contagious ecthyma occur most commonly on the feet and lips of lambs, they also occur in the oral cavity. Severe tongue lesions involving a high percentage of slaughtered lambs from individual properties have occasionally led to the suspicion of an exotic vesicular disease outbreak. Histologically, the lesions of contagious ecthyma are characteristic.

AFIP Diagnoses. 1) Glossitis, pustular, erosive, acute, multifocal, severe, with epithelial ballooning degeneration and eosinophilic intracytoplasmic inclusion bodies, tongue, breed unspecified, ovine; etiology--compatible with parapoxvirus. 2) Sarcocysts, multifocal, intramuscular, tongue.

Conference Note. Participants noted bacterial colonies superficially on the tongue but did not think they were associated with the inflammatory response. The differential diagnosis based on the histopathology alone included foot and mouth disease, blue tongue, sheep pox, and ulcerative dermatosis. The severe proliferative response which sometimes results in an exophytic lesion can serve to differentiate contagious ecthyma from other diseases, but is not evident in this case. Presence of intracytoplasmic inclusion bodies is not a reliable feature of this disease since they are often transient; in contrast, inclusion bodies are reliably found in sheep pox. Lesions of blue tongue are often angiocentric due to the predilection of that virus for endothelial cells. Clinically, blue tongue and sheep pox are usually accompanied by severe systemic disease, while contagious ecthyma rarely is. Interestingly, colostral antibodies are not protective, and the disease is commonly seen in lambs in their second week of life.

Contributor. Palmerston North Animal Health Laboratory, P.O. Box 1654, Palmerston North, New Zealand.

Suggested reading.
Blood, D. C., Radostits, O. M., and Henderson, J. A.: Veterinary Medicine, 6th Ed., Baillieri Tindall, 1983, pp 837-838.
Dieterich, R. A., Spencer, G. R., Burger, D. et al.: Contagious ecthyma in Alaskan musk-oxen and Dall sheep. J. Am. Vet. Med. Assoc. 179(11): 1140-1143, 1981.
Erickson, G. A., Carbrey, E. A., and Gustafson, G. A.: Generalized contagious ecthyma in a sheep rancher: Diagnostic considerations. J. Am. Vet. Med. Assoc. 166(3): 262-263, 1975.
Jensen, Rue, and Swift, B. L.: Diseases of Sheep, 2nd Ed., Lea & Febiger, 1982, pp 109-111.
Jubb, K. V., and Kennedy, P. C.: Pathology of Domestic Animals, Vol. 2, Academic Press, 1970, pp 595-596.
Lance, W., Adrian, W., and Widhalm, B.: An epizootic of contagious ecthyma in Rocky Mountain Bighorn sheep in Colorado. J. Wildlife Dis. 17(4): 601-603, 181.

Case II - 81-1995A, 81-1995B, 81-1995C (AFIP 1947250). (1 EM photo included).

History. Tissue from a mature Angora male goat. A clinically normal goat was killed following an experimental procedure.

Gross Pathology. Numerous gray-white lobular masses were found throughout the liver and a single 3x5 cm lobular mass protruded from the serosal surface of the abomasum. The cut surface of the abomasal mass revealed several nodules with necrotic and lightly mineralized centers extending from the mucosal surface through the serosa. In the liver, larger, necrotic and cavitated masses varying from 4 to 8 cm in diameter, smaller solid masses, ranging from 0.5 to 1.25 cm were observed.

Contributor's Diagnosis & Comment. Gastric carcinoid, abomasum with hepatic metastasis.

Neoplastic cells in both the abomasum and liver were identical. Metastatic sites in the liver differed only in that mineralization was not seen in areas of necrosis. Diagnosis was based on the characteristic light microscopic appearance of the tumor and the ultrasturctural findings of dense intracytoplasmic membrane-bound secretory granules in tumor cells.

AFIP Diagnosis. Malignant neoplasm, abomasum, Angora, caprine.

Conference Note. The differential diagnosis included coalescing granulomas, carcinoid, and various sarcomas. The moderator, who contributed this case, showed a section of liver to which the neoplasm had metastasized forming ribbons, papillary, and solid patterns of growth. Silver stains of the abomasal mass revealed small nests of cells with what appeared to be argyrophyllic granules within the cytoplasm; however, since these nests were adjacent to areas of calcification, the stain was deemed equivocal. The ultrastructural features of the neoplastic cells, as seen by the electronphotomicrograph, were not considered by participants to be diagnostic; the ultrastructural pathology section of the contributing institution reported finding characteristic carcinoid granules in numerous sections they examined.

Carcinoids have never been reported in the goat, and are extremely rare in domestic species other than the African rodent, Praomys (Mastromys) natalensis, which has a high incidence in old animals. The neoplasms arise from both argentaffin and non-argentaffin cells which are part of the amine precursor uptake and decarboxylation (APUD) group of cells. These cells were all formerly thought to be derived from the neural crest, although this is no longer held to be true of most APUD cells. In man, carcinoids are responsible for a carcinoid syndrome which results from the release by the neoplasm of vasoactive amines, primarily serotonin and kallikrein (Sykes, 1982).

Contributor. Comparative Pathology Branch, US Army Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, Maryland 21010.

Suggested reading.

Giles, R. C. Jr., Hildebrandt, P. K. and Montgomery, C. A. Jr.: Carcinoid tumor in the small intestine of a dog. Vet. Path. 11: 340-349, 1974.

Moulton, J. E. (Ed.): Tumors in Domestic Animals. University of California Press, Berkeley, 1978, pp 266-268.

Patnaik, A. K., Hurvitz, A. I., and Johnson, G. F.: Canine intestinal adenocarcinoma and carcnoid. Vet. Path. 17: 149-163, 1980.

Snell, K. C., and Stewart, H. L.: Malignant argyrophilic gastric carcinoids of Praomys (Mastomys) natalensis. Science 163: 470, 1969.

Sykes, G. P., and Cooper, B. J.: Canine intestinal carcinoids. Vet. Path. 19: 120-131, 1982.

Case III - no contrib # (blood smear) (AFIP 1964885).

History. Adult female Macaca fascicularis purchased as one of a group of macaques acquired from various universities; prior use of these animals varied from experimental surgery to fetal plumbism studies to psychological research.

11 Aug 1982: Initial physical exam:

wt = 5.4 kg.
Bilateral alopecia
Hematologic and serum chemical values were within normal limits for the laboratory.
T_3 = 43.5
T_4 = 6.2
T_7 = 2.69

Gross Pathology.

1) Diffuse, severe, glomerulonephritis, bilateral.
2) Diffuse pigment deposition, liver and spleen.
3) Adenoma, adrenal cortex. (3 x 4 cm mass).
4) Atrophy, epidermis, mild, with fragmentation and follicular keratosis.

Laboratory Results.

January 1983:

		Normal (+/-)
RBC	4.96×10^6	5.34 (.43)
Hbg	10.9 g/dl	11.0 (1.0)
HCT	36.9%	32.9 (2.9)
MCV	74 fL	62.0 (3.0)
MCH	22.0	
MCHC	29.5	

	Normal)+/-)
WBC 11.3	9.3 (3.3)
% Neutrophil 65.	
% Lymphocyte 28.	
% Monocyte 07.	

March 1983:

Hematology:

RBC	6.98×10^6	WBC	20.3
Hbg	13.3 g/dl	% Neutrophil	69
HCT	45.2%	% Lymphocyte	23
MCV	65 fL	% Monocyte	4
MCH	19.1	% Eosinophil	4
MCHC	29.2		

Note: Serum chemistries within two standard deviations of laboratory and/or published normal values in January and March.

22 August 1983:

Animal was found incoordinated and anorexic, and was euthanatized.

Hematology		Normal (+/-)	Chemistries (STAT)		Normal (+/-)
RBC	5.2×10^6	5.34 (.43)	BUN	125.9 mg/dL	19.6 (3.94)
Hbg	9.5 g/dL	11.0 (1.0)	Creatinine	2.81 mg/dL	.95 (.2)
HCT	35.6%	32.9 (2.9)	TProt	5.2 g/dL	8.2 (1.0)
MCV	69.0 fL	62.0 (3.0)	Phosphate	17.4 mg/dL	4.2 (1.3)
WBC	7.5×10^3		Glucose	86.9 mg/dL	56 (9)
% Neutrophil	78		Cholesterol	225.7 mg/dL	*151 (21)
% Lymphocyte	18		Triglycerides	145.3 mg/dL	*117 (76)
% Monocyte	2				
% Bands	2				
NRBC = 74/100 WBC					

Interpretation:

Blood smear: Anisocytosis, poikilocytosis, "target" cells, nucleated RBC's, Howell Jolly bodies, and malaria parasitism.

Hematology: Low blood hemoglobin and leukopenia with lymphopenia.

Chemistries: Marked phosphatemia with elevated creatinine, BUN, cholesterol, glucose and with hypoproteinemia.

Comment: Trophozoite (ring) and schizont stages are present in parasitized erythrocytes. The percent of parasitized erythrocytes, the stages present concurrently, and granules within the trophozoites are typical of *Plasmodium inui*. This animal was in terminal renal failure when this smear was made.

Malaria parasitism in the Cynomolgus monkey is usually silent, unless exacerbated by stress or splenectomy.

There are four plasmodial parasites that commonly infect macques. *P. vivax* is distinguished by marked erythrocytic hypertrophy and characteristic staining of the gametes. *P. knowlesi*, the main differential for *P. inui*, is a fulminating disease, with two to three parasites per erythrocyte, and infection of 100% of the erythrocytes; survival is rare. *P. cynomolgi* infections are rare, and limited to rhesus monkeys. *P. inui* is relatively common, and infection of 80-85% of the circulating erythrocytes is considered to be a heavy infection. The disease is usually chronic, with cyclic (waft and wane) parasitemia. The gametes have characteristic staining qualities, but basophilic stippling is a function of pH.

AFIP Diagnosis. Erythroparasitemia, protozoal, diffuse, moderate, peripheral blood, Cynomologus monkey, *Macaca fascicularis*, primate; etiology-compatible with *Plasmodium* spp.

Conference Note. Participants noted ring forms and trophozoites within parasitized red blood cells. Malarial pigment (hemazoin) present in association with trophozoites, cannot be differentiated from acid hematin histochemically; it is, however, positive for iron following microincineration, whereas acid hematin is not.

In the differential diagnosis Hepatocystis spp. must be included since parasitized red blood cells also contain trophozoites, gametocytes, and hemazoin, but intraerythrocytic schizogony does not occur as it does with Plasmodium spp.

Nucleated erythrocytes were reported in the laboratory results but participants did not consider them a remarkable feature in this smear. Also the lymphopenia seen terminally could have been due to the immunosuppressive effects of the adrenal cortical tumor or the high BUN. Some also thought the fact that the animal was immunosuppressed was additionally reflected by hypersegmentation of neutrophils which were staying in circulation longer because younger cells could not be released from the bone marrow.

Contributor. Division of Pathology, Walter Reed Army Institute of Research, Washington, DC 20307.

Suggested reading.

Coatney, R. R.: The Primate Malarias. U.S. Government Printing Office, 1974.
Loeb, W. F.: Hematologic disorders. In Pathology of Laboratory Animals, (Benirschke, Garner, Jones, Eds.), Springer-Verlag, 1978, pp 890-1050.
Schmidt, L. H.: The characteristics of Plasmodium cynomolgi infections in various Old World primates. Am. J. Trop. Med. Hyg. 26: 356-372, 1977.
Stokes, et al.: Acute clinical malaria (Plasmodium inui) in a Cynomolgus monkey (Macaca fascicularis). Lab. Ani. Sci. 33: 81-89, 1983.
Voller, A.: Plasmodium and hepatocystis. In Pathology of Simian Primates, Part II, Karger, Basel, 1972, pp 57-73.

Case IV - 81-592 (AFIP 1900952).

History. Tissues from two 4-week-old male broad breasted white turkey poults. These two poults are from a flock which had loose droppings accompanied by a modest increase in mortality beginning at 3 weeks of age. Blindness with lens opacities was seen in about 1% of the birds, and ataxia and torticollis in about 0.1% of the birds.

Gross Pathology. A white-yellow exudate was present in the lateral ventricles. No other gross lesions were seen.

Laboratory Results. Salmonella arizonae was cultured from the eyes.

Contributor's Diagnoses & Comment. 1) Ventriculitis, granulomatous, diffuse, chronic, severe, lateral ventricles, turkey. 2) Leptomeningitis, pleocellular, diffuse, chronic, severe, turkey.

Not all sections contain both lesions. Bacterial rods can be seen in the exudate within the lateral ventricles. These are gram-negative and probably represent S. arizonae.

S. arizonae infection of the brain has been reported in turkeys (West, 1974) and chickens (Silva, 1980). Granulomatous inflammation was the prominent reaction in the chicken, but was not a feature in the turkey. This is the first report of S. arizonae infection producing a granulomatous reaction in the brain of the turkey (Jortner, 1983).

AFIP Diagnoses. 1) Ventriculitis, necrogranulomatous, segmental, severe, with bacterial colonies, lateral ventricle, brain, broad breasted white turkey, avian. 2) Meningoencephalitis, granulomatous, diffuse, mild to moderate, brain; etiology--compatible with Salmonella arizonae.

Conference Note. Some histologic sections do not contain lateral ventricle. Salmonella arizonae formerly Arizona hinshawii is a frequent infection of turkey poults less than 5 weeks of age; chicks and other birds are occasionally infected as are reptiles and man. The organisms localize in the ovary of infected birds often leading to eggshell penetration. The disease is seen most frequently as a systemic illness which affects many organ systems. Opacities of the eye (ophthalmitis) as were seen in a small percentage of the flock represented by this case, are seen in a significant number of poults infected with S. arizonae, but may also be seen in birds afflicted with paratyphoid, Newcastle disease, aspergillosis, or colibacillosis. Caseous caecal and intestinal plugs are characteristic of S. arizonae but also of other Salmonella spp. Granulomatous lesions in the brains of chicks and poults must be distinguished from Dactylaria gallopava, a dematiacious fungus.

Contributor. Virginia-Maryland Regional College of Veterinary Medicine, Virginia Tech, Blacksburg, Virginia 24061.

Suggested reading.

Cambre, R. C., Green, D. Earl, Smith, E. E. et al.: Salmonellosis and arizonosis in the reptile collection at the National Zoological Park. J. Am. Vet. Med. Assoc. 177(9): 800-803, 1980.

Hofstad, M. S. (Ed.): Diseases of Poultry, 7th Ed., Iowa State University Press, 1978, pp 169-179.

Jortner, B. S. and Larsen, C.: Granulomatous ventriculitis of the brain in arizonosis of turkeys. Vet. Path. 21: 114-115, 1984.

Silva, E. N.: Natural and experimental Salmonella arizonae infection in broilers. Bacteriological and histopathological survey of eye lesions. Avian Dis. 24: 631-636, 1980.

West, J. L., and Mohanty, G. C.: Arizona hinshawii infection in turkey poults: Pathologic changes. Avian Dis. 17: 314-324, 1974.

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Results
AFIP Wednesday Slide Conference - No. 24
3 April 1985

Conference Moderator: Leonard H. Billups, DVM
Diplomate ACVP
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Case I - 84N143 (AFIP 1947882).

History. Tissue from a 2-year-old male coonhound which exhibited acute onset of rear limb paralysis following several months of rear limb weakness.

Gross Pathology.
1) Osteomyelitis of thoracolumbar spine.
2) Fistulous inflammation of sublumbar musculature.
3) Multifocal pneumonia.
4) Porcupine quills found in stomach, mesentery and spinal column.

Laboratory Results.
Pasteurella multocida was cultured from the sublumbar muscles.

Contributor's Diagnosis & Comment. Fistulous pyogranulomatous inflammation of the mesentery of the small intestine caused by a migrating porcupine quill.

On subsequent investigation, the owner reported that the dog had exposure to a porcupine two months prior to the start of the illness. The lung lesion appeared as if there were migratory tracts through the lungs toward the dorsal and caudal lobes. Similar migrations of plant awns can result in the thoraco-lumbar osteomyelitis. The fact that P. multocida was isolated might be additional evidence suggesting that the quills migrated to the T-L juncture through the lungs. Quills lodged in the stomach and duodenum were very short.

AFIP Diagnosis. Pyogranulomas, chronic, multifocal, severe, with associated central foreign material, omentum (per contributor), coonhound, canine.

Conference Note. The nature of the central foreign material present within the pyogranulomas was discussed; plant material, porcupine quill, and suture material were considered the most likely. The presence of a dark granular pigment and the laminated structure of the material is highly suggestive of a hair shaft or similar keratinaceous structure. Plant material would be PAS positive and highly anisotropic. The material in this case is not PAS positive and is only weakly anisotropic. In many sections, however, several fragments of plant material, clearly identifiable by the thick cell walls, are present within the pyogranulomas. Presumably, this material was carried in with the quill.

Contributor. Department of Veterinary Science, School of Veterinary Medicine, University of Wisconsin, 1655 Linden Drive, Madison, Wisconsin 53706.

Suggested reading.

Brennan, K. E., and Ihrke, P. J.: Grass awn migration in dogs and cats: A retrospective study of 182 cases. J. Am. Vet. Med. Assoc. 182(11): 1201-1204, 1983.

Mirakhur, K. K., and Khanna, A. K.: Removal of a porcupine quill from the temporal fossa of a dog - a case report. Canine Pract. 10(3): 100-101, 1983.

Morshead, D.: Submucosal urethral calculus secondary to foxtail awn migration in a dog. J. Am. Vet. Med. Assoc. 182(11): 1247-1248, 1983.

Case II - HLA 8424 (AFIP 1948733).

History. Tissue from a 2-day-old 90 lb. male Holstein calf. This herd was found to be experiencing an increased incidence of metritis, retained placenta, stillbirth, and weak calves in a group of first calf heifers. Calves born to dams in this group usually exhibited swelling of the ventral neck region below the larynx and gross lesions similar to those noted in this case. In contrast, calves born to mature cows were normal. In several instances, weak calves were treated with injectable Polyflex (Bristol Laboratories brand of ampicillin), and showed a marked clinical improvement with reduction of the swelling in 3-5 days.

Gross Pathology. Enlarged thyroids with several hemorrhagic areas. No other gross lesions noted.

Contributor's Morphologic Diagnosis & Comment. Hyperplastic goiter, congenital. Etiology, iodine deficiency.

Further investigation revealed that the group of first calf heifers had inadvertently been supplemented with salt only, while the mature cows had received a balanced mineral mix that included iodine. The marked clinical improvement with reduction in thyroid size in the calves treated with Polyflex apparently resulted from the presence of 500 mg of Povidone-Iodine as a preservative in each 25 gm vial of Polyflex.

Histologic changes included hypertrophy of the follicular epithelium to a columnar type, with hyperplasia and papillary infoldings. Essentially no colloid was present within follicles.

AFIP Diagnoses. 1) Hyperplasia, follicular, papillary, diffuse, moderate to severe, with scant colloid, thyroid, Holstein, bovine; condition consistent with a "hyperplastic goiter". 2) Hemorrhage, fibrin deposition and organization, subcapsular, subacute, multifocal, moderate, thyroid.

Conference Note. Most histologic sections contain some small follicles which identify the tissue as thyroid. Differentiation of this hyperplastic goiter from a thyroid adenocarcinoma is based on the degree of organization of the tissues and the presence of normal structures such as nerves which would be effaced by an infiltrative neoplasm.

The discussion centered on the types of goiter seen in domestic animals, common goitrogenic substances, and some aspects of the ecology of iodine deficiency in animals. Generally speaking, hyperplastic goiter is due to profound iodine deficiency. The hyperplasia results from the effects of thyroid stimulating hormone upon the follicular epithelium. Introduction of iodine to the diet of an animal with hyperplastic goiter or to one experiencing mild iodine deficiency can result in colloid goiter. Less common are nodular goiters which bear histological similarities to both hyperplastic and colloid goiters and are usually clinically silent. Toxic goiter is characterized by mild hyperplasia and is common in man (Grave's disease) but rare in other animals.

The cause of the subcapsular and interstitial hemorrhage with organizing fibrinous clots was speculated by participants to have been the result of trauma during parturition, possibly due to the prominence of the enlarged thyroid. The hemorrhage and tissue damage from such trauma would explain the mild mixed inflammatory cell infiltration present in the connective tissues adjacent to the thyroid seen in most sections.

Contributor. Hazleton Laboratories, 9200 Leesburg Turnpike, Vienna, Virginia 22180.

Suggested reading.

Blood, D. C., Radostits, O. M., and Henderson, J. A.: Veterinary Medicine, 6th Edition, Bailliere Tindall, 1983, pp. 1031-1034.

Doige, C. E., and McLaughlin, B. G.: Hyperplastic goitre in newborn foals in Western Canada. Can. Vet. J. 22: 42-45, 1981.

Hoenig, M., Goldschmidt, M. H., Ferguson, D. C. et al.: Toxic nodular goitre in the cat. J. Small Anim. Pract. 23: 1-12, 1982.

Jubb, K.V.F., and Kennedy, P. C.: Pathology of domestic Animals, 2nd Edition, Academic Press, New York, 1970, pp. 411-415.

McLaughlin, B. G., and Doige, C. E.: Congenital musculoskeletal lesions and hyperplastic goitre in foals. Can. Vet. J. 22: 130-133, 1981.

Case III - no contrib # (AFIP 1942619). (2 radiographic slides)

History. Tissue from an 11-year-old male terrier, canine. This dog presented with a one-week history of anorexia and depression and 4-day history of diarrhea. On physical exam, conjunctiva were pale and the abdomen was tense. Radiography revealed pulmonary increased density, possible renal calculi and an abdominal circumscribed mass.

Gross Pathology. At surgery, a mass found incorporating the duodenum was resected. The mass was necrotic with perforating ulceration and was firm to hard and white, with a fibrous texture. There was also a firm omental nodule. The dog recovered uneventfually, but returned one month later with recurrence of the abdominal mass. The dog was euthanatized; at necropsy, nodules were found throughout the liver, omentum and gastrointestinal tract. No skeletal masses were found.

Laboratory Results.

Presurgical:	Prior to death:
Hematology:	
WBC 53.0 x 10^3	38.7 x 10^3
RBC 27.79 x 10^6	3.14 x 10^3
HgB 6.4 g/dl	8.0 g/dl
HCT 19.0%	23.3%
MCV 68.1 fl	74.0 fl
MCH 22.8 pg	25.6 pg
MCHC 33.5 g/dl	34.5 g/dl
PLT 90.5 x 10^3	84.0 x 10^3
Differential:	
Seg 64%	71%
Band 10%	5%
Lymph 22%	5%
Mono 4%	11%
EOS 0%	8%

Presurgical: Slight polychromasia and moderate anisocytosis, microcytosis and hypochromasia. Reticulocyte count 3.8.

Prior to death: Slight poikilocytosis and moderate microcytosis, macrocytosis and polychromasia.

Serum chemistry:
Presurgical:
Urea 15 mg%
Creatinine 0.6
Sodium 149 meq/L
Potassium 4.5
Phosphate 4.2 mg%
Calcium 8.0
Total protein 5.2 gm%
Albumin 2.0 gm%
Alkaline phosphatase 506 IU/L
SGOP 49

UA:

Presurgical:		Prior to death:
Color	Yellow	Yellow
Specific gravity	1030	1031
Urobilinogen	Neg	Neg
Occult blood	"	"
Bile	"	"
Ketones	"	"
Glucose	"	"
Bilirubin	"	"
Protein	Pos	Pos
pH	7.5	7.0

Contributor's Diagnosis & Comment. Osteosarcoma, duodenum, with metastasis to omentum, spontaneous neoplasm.

Canine extraskeletal osteosarcomas, also variously diagnosed as malignant mesenchymomas, arise infrequently in soft tissues and have been rarely reported as primary tumors in the absence of Spirocerca lupi infection. The histiogenesis of the ossifying tumor in extraskeletal soft tissues remains controversial.

AFIP Diagnosis. Osteosarcoma, with chondromatous differentiation, small intestine, terrier, canine.

Conference Note. The radiographic slides reveal abdominal radiodensities which on the lateral view, are located in the region of L_5 and L_6 ventral to the kidney.

Extraskeletal osteosarcomas are known to occur in association with other conditions such as mixed mammary tumors, mixed tumors of the thyroid, and Spirocerca lupi granulomas of the esophagus (Alexander, 1979). They are also thought to arise from areas of myositis ossificans or from foci of dystrophic ossification. Visceral osteosarcomas are considered to be manifestations of teratoma development (Eckerlin, 1976). The histiogenesis of ossifying tumors in extraskeletal soft tissues is controversial. In the mixed tumors (mammary, thyroid) it is currently thought that cartilage develops from metaplasia of myoepithelial cells; bone develops from endochondral ossification of the cartilage. In tissues other than thyroid and mammary gland, it is thought osteosarcomas may arise from malignant myoepithelial cells which can originate from

many glandular tissues (Bardet, 1983). The neoplasm in this case has many similarities with the jejunal neoplasm reported by Eckerlin, Garman, and Fowler in 1976.

Contributor. Department of Veterinary Medicine, 10th Medical Laboratory, APO New York 09180.

Suggested reading.

Alexander, J. W., Walker, M. A., and Easley, J. R.: Extraskeletal osteosarcoma in a dog. J. Amer. Anim. Hosp. Assoc. 15: 99-102, 1979.

Bardet, J. F., Weisbrode, S., and DeHoff, W. D.: Extraskeletal osteosarcomas: Literature review and a case presentation. J. Amer. Anim. Hosp. Assoc. 19: 601-604, 1983.

Moore, R. W., Snyder, S. P., Houchens, J. W. et al.: Malignant mesenchymoma in a dog. J. Amer. Anim. Hosp. Assoc. 19: 187-190, 1983.

Eckerlin, R. H., Garman, R. H., and Fowler, E. H.: J. Amer. Vet. Med. Assoc. 168(8): 691-693, 1976.

Jeraj, K. Yano, B., Osborne, C. A. et al.: Primary hepatic osteosarcoma in a dog. J. Am. Vet. Med. Assoc. 179(10): 1000-1003, 1981.

Pollock, S., Franklin, G. A., and Wagner, B. M.: Clinical signficance of trauma, myositis ossificans, and malignant mesenchymoma in the dog: Report of an unusual case. J. Amer. Anim. Hosp. Assoc. 1: 237-242, 1978.

Case IV - 84-91 (AFIP 1948878). (2 microslides)

History. Tissue from a 3-year-old male mixed breed canine. The dog was presented with clinical signs of tetraparesis, it could not stand unassisted, and had a swollen, hot, left carpal joint. The dog had a history of unilateral endophthalmitis of two month's duration and a swelling of the left carpal joint of one week's duration.

Gross Pathology. The ventricular myocardium contained multifocal pale yellow areas up to 5 mm in diameter. The spleen and kidneys contained similar lesions varying in size from 1 mm to 1 cm in diameter. There was destruction of intervertebral discs and adjacent metaphyses of T_{2-3} and T_{4-5}. Similar extensive loss of bone had occurred in the radial carpal bone, and the articular surface was dull, granular and focally eroded. The cornea of the left eye was opaque and vascularised

Laboratory Results.

Urinanalysis: Cloudy, Blood +++, Protein ++, Neutrophils ++, Red blood cells +++, Transitional epithelial cells ++, Coarse granular case ++, Fungal hyphae present.

Microbiology: *Aspergillus terreus* was isolated from the spleen, heart, kidney and thoracic vertebrae.

Contributor's Diagnosis & Comment. Nephritis, multifocal, pyogranulomatous, necrotizing. Fungal hyphae and aleuriospores, kidney, mixed breed, dog. Etiology - *Aspergillus terreus*.

The case is typical of several cases of disseminated *A. terreus* infection seen over the past four years. The majority have been in the German shepherd breed. The reasons for the relatively sudden appearance of the disease is unclear.

AFIP Diagnosis. Nephritis, necrogranulomatous, chronic-active, multifocal, severe, with vasculitis, infarction, and intralesional fungal hyphae, kidney, mixed breed, canine.

Conference Note. A vascular distribution of the etiologic agent is suggested by multifocal thrombi present at the corticomedullary junction with areas of infarction in the deeper cortex.

Fungal hyphae can be seen on both the H&E and PAS-stained sections, but are seen best with GMS. The hyphae are parallel-walled, septate, and range from 5-12 microns in diameter. Terminal, up to 20 micron bulbous swellings are present on hyphae, as are occasional spores which bud laterally off of hyphae. Since no pseudohyphae or yeast forms are present, organisms such as Candida and Blastomyces can be ruled out. Hyphae of zygomycetes are rarely septate, have nonparallel walls, and are generally wider than those in this case. The large terminal and occasional lateral aleurospores seen on hyphae in this case are diagnostic for Aspergillus terreus, differentiating it from other Aspergillus spp. and paeliomycetes. These spores, however, are not readily visible without GMS stains. This case bears many similarities to cases of disseminated A. terreus in dogs reported by Wood (1978) and by Mullhaney (1983).

Participants noted the monotonous population of lymphoblastic cells in the interstitium of this kidney and hypothesized that an underlying neoplastic disease of the lymphoreticular system may have served to immunosuppress the animal and predispose it to fungal infection. Participants also noted glomerular changes which were interpreted as fibrin or amyloid deposition.

Contributor. Division of Veterinary Biology, School of Veterinary Studies, Murdoch University, Murdoch, W. A. 6150.

Suggested reading.

Mullhaney, T. P., Levin, S., and Indrieri, R. J.: Disseminated aspergillosis in a dog. J. Am. Vet. Med. Assoc. 182(5): 516-518, 1983.

Weitkamp, R. A.: Aspergilloma in two dogs. J. Amer. Anim. Hosp. Assoc. 18: 503-506, 1982.

Wood, G. L., Hirsh, D. C., Selcer, R. R. et al.: Disseminated aspergillosis in a dog. J. Am. Vet. Med. Assoc. 172(6): 704-707, 1978.

Zook, B. C., and Migaki, G.: Aspergillosis in animals. In Aspergillosis. Al-Doory, Y. and Wagner, G. E. (Eds), Chapt 12, Charles C. Thomas Publishing, Springfield, 1985, pp. 207-231.

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Department of Veterinary Pathology

Results
AFIP Wednesday Slide Conference - No. 25
10 April 1985

Conference Moderators: COL George D. Imes, Jr.
LTC John M. Pletcher
Department of Veterinary Pathology
Armed Forces Institute of Pathology
Washington, DC 20306

Case I - 82/9169 (AFIP 1949348).

History. Tissue from a 14-month-old male Scottish highland ferret (Mustela putorius furo). Seven of 700 ferrets on this property died after exhibiting variable nervous signs which included head tilt, circling, lethargy and depression. Both sexes were affected and all were young adults.

Gross Pathology. The right external ear canal was filled with thick, dark brown exudate. The tympanic membrane was ruptured and the middle ear contained purulent exudate. The adjacent bone and muscle were swollen and softened for up to 2 cm from the middle ear. In this region the meninges were thickened and firmly adherent to the bone. The underlying cerebrum, especially the right pyriform lobe was dark red, swollen and malacic.

Laboratory Results. Large numbers of ear mites (Otodectes cynotis) were in the exudate from the right external ear canal. Staphyloccus aureus was cultured from the right ear and meninges.

Large numbers of non-septate fungal hyphae were seen in smears from the right ear and meninges. An Absidia sp. was cultured.

Contributor's Morphologic Diagnosis & Comment.
Chronic pyogranulomatous meningoencephalitis with vascular thrombosis, necrosis and numerous non-septate fungal hyphae.
Etiology: Absidia sp.
This entity has been recognized on several ferret farms throughout New Zealand. The fungal infection appears to originate in the external ear canal and spread to the middle ear and adjacent structures, including bone, muscle, meninges and brain. Circumstantial evidence suggests that heavy ear mite infestations predispose to the disease, perhaps by creating a suitable environment for fungal growth in the external ear canal.
Most positive fungal cultures have yielded Absidia spp.
(These slides are stained with Gomori's methenamine silver plus haemotoxylin and eosin).

AFIP Diagnosis. Meningoencephalitis and ventriculitis, necrogranulomatous, focally extensive, with vasculitis, thrombosis, and intralesional fungal hyphae, cerebrum, Scottish highland ferret, Mustela putorius furo, Mustelid.

Conference Note. In addition to lesions noted in the morphologic diagnosis, there is choroid plexitis and microabscesses scattered throughout the neuropil adjacent to severely affected areas. Fungal hyphae range from 9-15 microns in diameter, have non-parallel walls, are rarely septate, and branch irregularly. Zygomycosis is common in man secondary to untreated or poorly controlled diabetes mellitus where high blood sugar levels stimulate organisms to grow into vessels from surrounding tissues.

Contributor. Palmerston North Animal Health Laboratory, P.O. Box 1654, Palmerston North, New Zealand.

Suggested reading.

Chandler, F. W., Kaplan, W., and Ajello, L.: Zygomycosis. In Histopathology of Mycotic Diseases, Chapt 27, Year Book Medical Publishers, Chicago, 1980, pp. 122-127, 294-301.

Corbel, M. J., Hambleton, P., Baskerville, A. et al.: Biochemical and pathological changes in experimental phycomycosis. J. Comp. Path. 93: 219-234, 1983.

Case II - 48724 (AFIP 1897832).

History. Tissue from an 8-year-old female Doberman pinscher which exhibited gradual development of weakness and weight loss over six months. Gastrointestinal bleeding developed three days prior to presentation. Profound tetraparesis developed and the dog was euthanatized. At necropsy, vertebral lesions, cardiac ventricular dilitation, and blood throughout the small and large intestines were noted.

Gross Pathology. Intervertebral discs C5-6 and C-7 protruded into the spinal canal. The heart was globoid due to ventricular dilation. The stomach was normal; blood was present throughout small and large intestine.

Laboratory Results.

P.C.V. 10% prior to transfusion.

ECG - Ventricular premature contractions every 10th to 12th beat.

Contributor's Diagnosis & Comment. Chronic myocardial degeneration with interstitial and replacement fibrosis and fat infiltration; moderate arteriolar intimal cushion formation.

(Other: cervical intervertebral disc protrusion with Wallerian degeneration of spinal cord; hemorrhagic diathesis, possibly due to von Willebrand's disease.)

This case demonstrates part of the spectrum of myocardial degeneration and fibrosis which is commonly seen in young to middle-aged Dobermans. The cardiomyopathy in this dog had not yet been expressed as congestive heart failure, due to the intercession of concurrent disease: the wobbler syndrome and a hemorrhagic diathesis. Ventricular dilation, myocardial fibrosis and atrioventricular valvular endocardiosis are the prominent gross findings in Dobermans with advanced heart disease.

AFIP Diagnosis. Degeneration and fibrosis, multifocal and coalescing, moderate, with lipidosis, myocardium, Doberman pinscher, canine.

Conference Note. The lesions present in this case are essentially the same as those described by Hazlett et al. (1983) and Calvert et al. (1982). The Department of Cardiovascular Pathology interpreted the extensive interstitial fibrosis, myositis (occasional mononuclear inflammatory cells and rare aggregates of neutrophils), and variation in fiber size as compatible with a healing phase of myocarditis which can be correlated clinically with human patients having dilated cardiomyopathy. They also noted concentric and eccentric thickening of intramural coronary arteries and compare it to similar changes seen in humans with hypertrophic cardiomyopathy. This change was also noted in Doberman hearts examined by Calvert and Hazlett, but was not readily apparent in sections examined by conference participants.

Other acquired heart diseases reported in Dobermans include hypertrophic cardiomyopathy (Liu, 1979) and atrioventricular bundle degeneration causing sudden death (James, 1962; Sandusky, 1979).

The term "fatty/lipid infiltration", as is seen in this case, is probably not appropriate since these adipocytes are thought to arise in situ from perivascular pleuripotential mesenchymal cells.

Contributor. Veterinary Laboratory Services, Ontario Ministry of Agriculture and Food, P.O. Box 3612, Guelph, Ontario N1H 6R8.

Suggested reading.

Calvert, C. A., Chapman, W. L., and Toal, R. L.: Congestive cardiomyopathy in Doberman pinscher dogs. J. Am. Vet. Med. Assoc. 181(6): 598-602, 1982.

Hazlett, M. J., Maxie, M. G., Allen, D. G. et al.: A retrospective study of heart disease in doberman pinscher dogs. Can. Vet. J. 24(7): 205-210, 1983.

James, T. N., and Drake, E. H.: Sudden death in Doberman pinschers. Ann. Int. Med. 68(4): 821-829, 1968.

Liu, Si-Kwang, Maron, B. J., and Tilley, L. P.: Hypertrophic cardiomyopathy in the dog. Am. J. Path. 94(3): 497-507, 1979.

Sandusky, G. E., Kerr, K. M., and Capen, C. C.: Morphologic variations and aging in the atrioventricular conduction system of large breed dogs. Anat. Rec. 193: 883-902, 1979.

Case III - 84-2174 (AFIP 1948332).

History. Tissue from a 13-year-old male Labrador retriever (Canis familiaris). The dog was a research subject in a project relating to therapy of neoplasia using heat and radiation. Squamous cell carcinoma of the lateral digits, right forefoot, was diagnosed in Jan 1984 and treated with radiation. The tumor did not regress but remained stable until Apr 30, 1984. New growth was noted on May 20. Amputation was undertaken but abondoned when nodules in the neck discovered during surgery proved upon examination of frozen sections to contain metastases.

Gross Pathology. The right thyroid is represented by a fibrous mass approximately 3 x 1-1/2 x 1 cm. An irregularly nodular mass about 1/2 cm. in thickness extends over ventral part of trachea and larynx. Right axillary lymph node is enlarged to approximately 3 x 1-1/2 x 1 cm. On cut surface this node is irregularly white and tan in nodular pattern. There are several buckshot pellets scattered through neck and subcutaneous tissue. There are several 1 to 1-1/2 mm.

whitish foci in ventricle. Coronary arteries are enlarged approximately 2X, are irregular and grayish white. Atrial ventricular valves are enlarged and mucoid. Left lung is reddish-purple and poorly inflated. There are 2 or 3 approximately 3 mm. whitish-gray nodules in diaphragmatic lobe. Shotgun pellets are in lung.

Contributor's Diagnosis & Comment. Atherosclerosis (perhaps arteriosclerosis is more appropriate, considering the mineralization present in some vessels) is not a common finding at necropsy of the dog. Attached reports list a number of neoplastic and degenerative abnormalities and even the residuals of earlier physical violence, the embedded shotgun pellets. This is a bit unusual, even for a dog 13 years old.

Excerpts from the submitted necropsy report are as follows:

Microscopic exam: There are several small foci of fatty infiltration in ventricle. Wall of coronary arteries is thickened 2 to 3X and there is reduction of diameter of lumen. In various areas these walls contain collections of large lipid-laden macrophages, irregular spaces from which lipid has apparently been removed by processing, cholesterol clefts, and sometimes a few small mononuclear cells. Aorta does not have signficant morphologic change. In much of lung there is thickening of interalveolar septae with increased connective tissue and small mononuclear cells. Near pleura there is a well circumscribed, but not encapsulated focus of discrete, cuboidal to polyhedral cells which are closely packed together and in which groups of cells are divided into lobules by trabeculae of connective tissue. The neoplastic mass is well vascularized. There is a small artery in which there is much proliferation of media to nearly obliterate lumen. A few lipid-laden macrophages are in wall of an arteriole between liver and gall bladder. There are two tiny foci of mineralization in the wall of this vessel. Some larger splenic arteriles have atherosclerotic changes. There is increased fibrous tissue in many capillary tufts. Sometimes there are atherosclerotic changes in wall of arcuate vessels of the kidney. Atherosclerotic changes are in wall of artery and arterioles associated with pancreas. Neoplastic tissue from mass in neck has morphologic characteristics like those described in lung nodules. Squamous cell carcinoma in the foot is confirmed. There is a small mass of neoplastic tissue like neoplastic tissue described in lung and in neck adjacent to one adrenal. There are mild atherosclerotic changes in arterioles nearby. Arteries and arterioles of the lymph node have atherosclerotic changes. There are atherosclerotic changes in blood vasculature in bone marrow.

Diagnosis: Carotid body tumor with metastasis to lung and periadrenal tissue; squamous cell carcinoma, foot; atherosclerosis, severe, diffuse; papillary cystic hyperplasia, prostate; glomerulosclerosis.

AFIP Diagnosis. Atherosclerosis, diffuse, moderate to severe intra- and extramural coronary arteries, Labrador retriever, canine.

Conference Note. The dog provides a useful contrast to many other species because of its resistance to the development of hypercholesterolemia and atherosclerosis. When the latter does occur in the dog it generally has little clinical signficance and in this context alone bears little relation to vascular disease in man. The diffuse atherosclerotic lesions noted in the necropsy report on this animal caused conference participants to speculate that the dog was hypothyroid. Thyroxine affects synthesis, catabolism, and biliary excretion of cholesterol. In hypothyroid animals cholesterol catabolism is reduced relative to

its synthesis; biliary excretion is also reduced with the net result being hypercholesterolemia.

Thomas and Kim (1983) wrote an excellent review of human atherosclerosis which includes current concepts on its pathogenesis; this paper is worthy of review.

Contributor. Department of Veterinary Science, University of Arizona, Bldg. 90, Tucson, Arizona 85721.

Suggested reading.

Dahme, E. G.: Atherosclerosis and arteriosclerosis in domestic animals. Ann. N.Y. Acad. Sci. 127(1): 657-668, 1965.

Gerrity, R. G.: The role of the monocyte in atherogenesis. Am. J. Path. 103(2): 181-190, 1981.

Mahley, R. W., and Weisgraber, K. H.: Canine hyperlipoproteinemia and atherosclerosis. Am. J. Path. 87(1): 205-219, 1977.

Robinson, M.: Generalized atherosclerosis in a dog. J. Sm. Anim. Pract. 17: 45-50, 1976.

Thomas, W. A., and Kim, D. N.: Atherosclerosis as a hyperplastic and/or neoplastic process. Lab. Invest. 48(3): 245-251, 1983.

Whitney, J. C.: Some aspects of the pathogenesis of canine arteriosclerosis. J. Sm. Anim. Pract. 17: 87-97, 1976.

Case IV - 19144-36 (AFIP 1947453).

History. Tissue from an adult female Cynomolgus monkey (Macaca fascicularis). The monkey died while on intrauterine doxycycline study.

Gross Pathology.

Gastric and duodenal ulceration and hemorrhage were noted plus moderate to severe renal and hepatic fatty change.

Contributor's Diagnoses & Comment.

Brain, neuronal ceroid-lipofuscinosis, diffuse.
Heart, myocardial ceroid-lipofuscinosis, diffuse.
Heart, fibrosis, myocardial, moderate, multifocal.

The unusual, bright red, cytoplasmic granules were autofluorescent and very weakly acid-fast positive. Similar granules were found in numerous tissues including skeletal muscle, biliary epithelium, ductal cells of the salivary gland, adrenal gland, and pancreas. The light microscopy of this case is essentially identical to the changes recently described in an unusual case of ceroid-lipofuscinosis in a Cynomolgus monkey (Jasty, Kowalski, et al., 1984). The monkey in this report showed no clinical signs of illness prior to sacrifice as a control in a drug safety evaluation. The cause of death of the present monkey was most likely related to doxycycline toxicity.

AFIP Diagnoses. 1) Fibrosis, interstitial, multifocal, moderate, myocardium, Cynomolgus monkey, Macaca fascicularis, primate. 2) Eosinophilic granules, intracytoplasmic, diffuse, moderate, neurons, glia, and myofibers, brain and heart.

Conference Note. Eosinophilic granules in the myocardial fibers of this monkey are typically perinuclear, which is the common location of myocardial lipofuscin pigment. Similar granules are present in endothelial cells of some cerebral vessels. Neuronal granules are less eosinophilic than those in the heart and frequently have a yellow-green hue typical of lipofuscin pigment. The Department of Histochemistry confirmed mild acid-fast staining and autofluorescence of the cytoplasmic granules. They reported that the pigment has the usual properties of ceroid-lipofuscin pigments, but that the amount present in this case would not be considered pathologic in an elderly human.

In man and various domestic animals, accumulations of lipopigments may result from an underlying enzyme deficiency and, in accumulating, may disrupt cellular functions (Dowson, 1982). Although Jasty (1984) has described several types of cytoplasmic granules in the monkey heart and similar granules in other tissues of a monkey, none of these has ever been associated with overt disease.

The marked nuclear atypia of myocytes, and extensive interstitial fibrosis present in this case, were not considered by participants to be unusual findings in an older primate. The cause of such changes is not known.

Contributor. Division of Comparative Medicine, School of Medicine, Johns Hopkins University, 720 Rutland Avenue, Baltimore, Maryland 21205.

Suggested reading.

Dowson, J. H., Armstrong, D., Koppang, N. et al.: Autofluorescence emission spectra of neuronal lipopigment in animal and human ceroidoses (ceroid-lipofuscinoses). Acta Neuropathol. 58: 152-156, 1982.

Hoover, D. M., Little, P. B., and Cole, W. D.: Neuronal ceroid-lipofuscinosis in a mature dog. Vet. Pathol. 21: 359-361, 1984.

Jasty, V., Kowalski, R. L., Fonseca, E. H. et al.: An unusual case of generalized ceroid-lipofuscinosis in a Cynomolgus monkey. Vet. Pathol. 21: 46-50, 1984.

Jasty, V., Jamison, J. R., and Hartnagel, R. E.: Three types of cytoplasmic granules in cardiac muscle cells of Cynomolgus monkeys (Macaca fascicularis). Vet. Pathol. 21: 505-508, 1984.

Nimmo Wilkie, J. S., and Hudson, E. B.: Neuronal and generalized ceroid-lipofuscinosis in a cocker spaniel. Vet. Pathol. 19: 623-628, 1982.

Pritchard, D. H., Jolly, R. D., Howell, L. J. et al.: Ceroid-lipidosis: An acquired storage-type disease of liver and hepatic lymph node. Vet. Pathol. 20: 242-244, 1983.

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Histories
AFIP Wednesday Slide Conference - No. 26
17 April 1985

Case I - 82-437 (AFIP 1983084).

History. Tissues from five double-crested cormorants which ranged in age from 20 to 28 days. Their diet consisted of unsupplemented whole smelt (ingested by the adult and regurgitated to the offspring). They were presented with deformities of beaks and limbs.

Case II - P1550A, P1557A, P1558A (AFIP 1948317). (1 kodachrome slide)

History. Tissues from 4-week-old broiler chickens, which were on feed containing grain contaminated with a fungus since one day of age.

Case III - 20228-32 (AFIP 1947452).

History. Tissue from an 11-week-old female Alaskan malamute dog from a litter born on 2/24/84. Some pups in the litter died approximately one month later with signs of diarrhea. A parvovirus titer at that time was negative. The remaining pups were "poor-doers." The submitted puppy weighed only 15 lbs. (at least 30 lbs. would be considered normal).

Gross Pathology.
Kidneys small, pale, firm with pebbly surface.
Multiple rib fractures.
Bones soft, could be cut with a knife.
Gross swelling and distortion of facial bones and mandible.
Enlarged parathyroid glands.
Anemic.

Laboratory Results.

Glucose	116 mg/dl	Serum Phosphate	28.8 mg/dl	RBC	2,070,000
Sodium	148 mmol/l	Potassium	6.2 mmol/l	Hct	19.25
Chloride	104 mmol/l	BUN	150 mg/dl	Hb	5.7
Calcium	8.8 mg/dl	Creatinine	5.1 mg/dl	MCV	92.99u^3
Protein	5.4 g/dl	Cholesterol	296 mg/dl	MCH	27.53 uug
Albumin	2.6 g/dl	Alk. Phosphatase	276 IU/L	MCHC	29.61%
SGOT	42 IU/L			Retic.	6%
SGPT	26 IU/L	WBC 11,292/mm^3			
LDH	70 IU/L	Neut. 68%	Eosino. 2%		
		Lymph. 26%	Mono. 4%		

Case IV - D84-8 (AFIP 1948322). (2 kodachrome slides)

History. Tissue from a 4-month-old male Yorkshire pig, which was one of a group of pigs (4-6 months old) fed home mix of wheat and flour middlings with ground macaroni, whey. No vitamin or mineral supplement were given nor were the animals vaccinated. They were watered when fed (twice daily), and housed on concrete floors. There was a 4-week history of animals staggering, weak, down, decreased feed consumption, and increased respiratory rate.

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Histories
AFIP Wednesday Slide Conference - No. 27
1 May 1985

Case I - 84-396 (AFIP 1966713).
History. Tissue from a wild groundhog of unknown age and sex.

Case II - V84-241 or V84-375 (AFIP 1945775).
History. Tissue from a 6-year-old female Yorkshire terrier dog. The dog presented with a 2 cm mass on the dorsal surface of the nose which had been present for approximately 5 months (V84-241). During this time the dog had been treated intermittently with antibiotics with only minimal success. Two months later, the dog presented with a "tumor" under the skin of the chest (V84-375). Subsequently (1 month later), another similar-appearing gross lesion has appeared on the trunk. This has not yet been biopsied.

Case III - V84-4206) AFIP 1947831).
History. Tissue from a 1-year-old male domestic shorthair cat. This animal developed crusty weeping lesions on the skin of the face, ears, chin and between the toes. The lesion became more severe over a 3-month period. The toes became swollen and a greenish-white creamy material could be expressed from some of the nail beds. The claws eventually sloughed from the front paws. No response was noted to prolonged therapy with systemic corticosteroids and antibiotics. Cyclophosphamide therapy was attempted without success. The cat was finally euthanatized.

Case IV - A84-75 (AFIP 1947834).
History. Tissue from a 10-year-old spayed female domestic shorthair cat. Non-healing cutaneous sores near the base of the tail had been present for about two months.

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Histories
AFIP Wednesday Slide Conference - No. 28
8 May 1985

Case I - 80650 (AFIP 1910089). (2 kodachrome slides)

History. Tissue from a 19-year-old quarter horse mare with a history of progressive weight loss and ulcerative coronitis.

Case II - 4265-83 (AFIP 1894683).

History. This 3-month-old Arabian filly was presented to teaching hospital with history of progressive abdominal distension and recurrent colic of 3 days duration.

Gross Pathology. Approximately 15 to 20 liters of cloudy, red fluid containing fibrin tags was present in the abdominal cavity. A 32x27x27 cm, 7 kg, tan-yellow mass was present in the ventral abdomen, and attached in part to the right uterine horn.

Case III - 83-11558 (AFIP 1941253). (3 kodachrome slides)

History. This 90-week-old bird was from a flock of 21,300 layers that had experienced an 8% mortality and a drop in egg production from 58% to 19% over the past seven days.

Gross Pathology. Depressed birds with comb lesions were selected for examination. Combs, eyelids and wattles were mildly to severely edematous. On some severely edematous combs there were multiple round rough brown depressed areas. In some birds the scales of the shank or the tracheal mucosa were hyperemic, or the esophageal mucosa was petechiated. Egg yolk peritonitis was frequent.

Case IV - N83--852 (AFIP 1902492).

History. Tissue from a 4-year-old quarter horse stallion with a 5-1/2 month history of diarrhea and progressive weight loss. Feces remained as cowpie-like despite therapy of Ivermectins and corticosteroids. Weight loss was especially rapid for 4 weeks prior to euthanasia and necropsy.

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Histories
AFIP Wednesday Slide Conference - No. 29
15 May 1985

Case I - 83-105 (AFIP 1899159).
History. Tissue from a 1-year-old standardbred male horse. This colt developed limb edema two weeks prior to presentation and was treated with Kanamycin. Ten days later it began bleeding from venipuncture sites and from the mouth. There were petechiae on the sclera and oral membranes with bleeding from the nose and mouth.

Case II - 2988-84 (AFIP 1946317). (1 kodachrome slide)
History. Tissue from a 4-day-old thoroughbred. This foal presented with a bloody diarrhea (frank blood) 12 hours prior to death. Last year, a similar condition affected one foal from this same farm.

Case III - 83-581 (AFIP 1957368).
History. Tissue from an adult equine. Two tumors appeared on the head of the horse, one below the medial canthus of each eye. The horse would scratch these tumors until they bled. Both tumors were removed surgically and submitted for histopathology.

Case IV - N-84-343 (AFIP 1947992).
History. Tissue from a 5-day-old male quarter horse. The foal appeared normal at birth but developed signs of colic which improved. The abdomen became distended with what was identified as urine. The foal died during surgery to repair the ruptured urinary bladder.

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Histories
AFIP Wednesday Slide Conference - No. 30
22 May 1985

Case I - H0836440 (AFIP 1945169).
History. Tissue from a 7-year-old, intact, female, German shorthaired pointer.

Case II - 75N 1446 (AFIP 1902435).
History. Tissue from a 1-year-old male Bernese mountain dog. This animal exhibited chronic anorexia, weight loss, stertorous respiration, conjunctivitis with prominent chemosis and multiple cutaneous nodules distributed over the entire body, but especially in nasal region, eyelids and scrotum. The clinical course was characterized by remissions and relapses.

Case III - 393-84 (AFIP 1946318).
History. Tissues from an 8-month female Hereford fetus. This aborted fetus was the eighth abortion to occur in the last month in a beef cow herd of 120. All aborted feti were eight to nine months of gestational age. All the cows had been present in the same pasture with the same bulls the previous summer, fall, and winter. The herd has had two to three abortions of undetermined etiology each year for the past few years.

Case IV - CP 84-29 (AFIP 1948004).
History. Tissue is from an adult DSH cat. No abnormal clinical signs were noted during the animal's use in a chronic exercise study.

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Registry of Veterinary Pathology
Department of Veterinary Pathology

Results
AFIP Wednesday Slide Conference - No. 27
1 May 1985

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Case I - 84-396 (AFIP 1966713).

History. Tissue from a wild groundhog of unknown age and sex. This wild groundhog wandered close to the home of a veterinary student. The animal was depressed and incoordinated; suspected of rabies, the animal was killed.

Gross Pathology. The animal had a severe crusting dermatitis, accompanied by alopecia on many areas of its body at necropsy.

Contributor's Diagnosis. Chronic active dermatitis due to Dermatophilus sp. infection - woodchuck.

AFIP Diagnosis. Dermatitis, plasmacytic, diffuse, mild, with hyperkeratosis, parakeratosis, acanthosis, and intra-keratinous dermatophilus-like organisms, glabrous skin, ground hog, rodent; etiology--compatible with Dermatophilus congolensis.

Conference Note. Due to the abrupt transition of haired to glabrous skin in many sections, participants surmised that such sections represent a mucocutaneous junction. The discussion centered on the immune status of this animal, questioning whether dermatophilosis was primary or secondary in this case. The infection in this case appears superficial; the classical alternate layering of neutrophils and keratin, so often seen in primary dermatophilosis, is not present. Additionally, the presence of a mild plasmacytic infiltrate, with occasional Russell body cells, in the papillary dermis, was suggestive of an immune-mediated disease.

The skin of susceptible animals is infected by zoospores shed from animals which have been chronically infected. Motile zoospores migrate chemotactically to areas of the susceptible host's skin from which the respiratory efflux of CO_2 is highest - thin skinned areas. Zoopores germinate to produce hyphae which penetrate the living epidermis and elicit an acute inflammatory response which is probably a response to products of cellular damage. Hyphae later divide, first transversely, then longitudinally, to produce zoospores (motile) which migrate to areas of lower CO_2 concentration (skin surface) where they can infect other areas of the host's skin, or infect other hosts by contact or via mechanical arthropod vectors (Scanlon, Garrett, Geiger, 1984).

There is now evidence for a pathogenic role for D. congolensis in tissues other than the skin. Similar organisms have been demonstrated in oral cavity granulomas and lymph nodes of cats, tonsillar abscesses in pigs, subcutaneous nodular disease

in man, and lymph node and subcutaneous abscesses in various other species (Gibson, Thomas, Domjahn, 1983).

Contributor. Laboratory of Pathology, School of Veterinary Medicine, University of Pennsylvania, 3800 Spruce Street, Philadelphia, Pennsylvania 19104.

Suggested reading.

Gibson, J. A., Thomas, R. J., and Domjahn, R. L.: Subcutaneous and lymph node granulomas due to Dermatophilus congolensis in a steer. Vet. Path. 20: 120-122, 1983.

Lloyd, D. H., and Noble, W. C.: Dermatophilus congolensis as a model pathogen in mice for the investigation of factors influencing skin infection. Br. vet. J. 138: 51-60, 1982.

Momotani, E., Inui, S., Ishikawa, Y. et al.: Granulomatous sub-dermal lesions in sheep inoculated with Dermatophilus congolensis. J. Comp. Path. 94: 33-43, 1984.

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Roberts, D. S.: The histopathology of epidermal infection with the actinomycete Dermatophilus congolensis. J. Path. Bact. 90: 213-216, 1965.

Scanlan, C. M., Garrett, P. D., and Geiger, D. B.: Dermatophilus congolensis infections of cattle and sheep. Comp. Cont. Educ. 6(1): S4-S9, 1984.

Case II - V84-241 or V84-375 (AFIP 1945775).

History. Tissue from a 6-year-old female Yorkshire terrier dog. The dog presented with a 2 cm mass on the dorsal surface of the nose which had been present for approximately 5 months (V84-241). During this time the dog had been treated intermittently with antibiotics with only minimal success. Two months later, the dog presented with a "tumor" under the skin of the chest (V84-375). Subsequently (1 month later), another similar-appearing gross lesion has appeared on the trunk. This has not yet been biopsied.

Contributor's Diagnosis & Comment. Panniculitis, pyogranulomatous, nodular, consistent with idiopathic sterile nodular panniculitis, clinically from subcutis of nose and chest.

While microbiologic cultures were not performed on the biopsied tissues, special stains (PAS, GMS, acid fast and gram) failed to reveal any causative agents.

Nodular panniculitis is probably not a specific disease entity, but the cause is not known. It is characterized by the development of sterile subcutaneous granulomas (lobular panniculitis) or pyogranulomas, that may, on occasion undergo cystic necrosis and ulceration. Most episodes develop first in dogs less than 6 months of age, but it may also be of adult onset. A breed predilection is seen for the dachshund. A beneficial repsonse to systemic glucocorticoids has been reported.

In addition to ruling out the presence of infectious agents, one should consider lupus erythematosis and pancreatitis in the differential diagnosis and also search for the presence of vasculitis before making the diagnosis of idiopathic nodular panniculitis.

AFIP Diagnosis. Panniculitis, nodular, granulomatous, diffuse, severe, skin, Yorkshire terrier, canine.

Conference Note. In most sections, scattered aggregates of neutrophils lead some participants to favor a modifier of pyogranulomatous over granulomatous. In some sections, focally-extensive edema and hemorrhage is present in the superficial subcutis.

The moderator did not think this case was typical of the cases of nodular panniculitis he has seen. The occurrence in this dog of several isolated nodules contrasts with the usual finding of large numbers of nodules which arise as a "crop". In other cases he has seen, the moderator noted a more characteristic pyogranulomatous response, with more eosinophils, and more macrophages with granules of partially catabolized lipids. This is most readily evident, in his experience, in thin (1 micron) sections. Some participants did, however, note areas of obvious fat necrosis with what appeared to be macrophages and occasional giant cells reacting to that process.

The differential diagnosis included infection by Sporotrichum, atypical mycobacteria, and fungi. Although special stains done at the AFIP were equivocal (as were the contributors), the moderator stressed that neither Sporotrichum nor atypical mycobacteria is easily demonstrated by routine special stains. It is important when culturing such lesions to culture from an excision biopsy, as the material which drains from the nodules is invariably contaminated.

Baker and Stannard (1975) divide canine nodular panniculitis into 2 forms: one form occurs in young dogs, is steroid-responsive, and regresses. The other form occurs in older dogs, is also steroid responsive but recurs when steroid therapy is reduced. Ackerman (1984) adds three more forms to include a form associated with lupus erythematosus, a form associated with pancreatitis, and a third form associated with erythema nodosum which is rare.

Contributor. Bushy Run Research Center, RD #4, Mellon Road, Export, Pennsylvania 15632.

Suggested reading.

Ackerman, L. J.: Canine nodular panniculitis. Comp. Cont. Educ. 6(9): 818-824, 1984.

Baker, B. B., and Stannard, A. A.: Nodular panniculitis in the dog. J. Am. Vet. Med. Assoc. 167(8): 752-755, 1975.

Edgar, T. P., and Furrow, R. D.: Idiopathic nodular panniculitis in a German shepherd. J. Am. Anim. Hosp. Assoc. 20: 603-606, 1984.

Moreau, P. M., Fiske, R. A., Lees, G. E. et al.: Disseminated necrotizing panniculitis and pancreatic nodular hyperplasia in a dog. J. Am. Vet. Med. Assoc. 180(4): 422-425, 1982.

Muller, G. H., Kirk, R. W., and Scott, D. W.: Animal Dermatology, W. B. Saunders Company, Philadelphia, 1983, pp. 706-711.

Suter, M., Lott-Stolz, G., and Wild, P.: Generalized nodular dermatofibrosis in six Alsations. Vet. Path. 20: 632-634, 1983.

Case III - V84-4206) AFIP 1947831).

History. Tissue from a 1-year-old male domestic shorthair cat. This animal developed crusty weeping lesions on the skin of the face, ears, chin and between the toes. The lesion became more severe over a 3-month period. The toes became swollen and a greenish-white creamy material could be expressed from some of the nail beds. The claws eventually sloughed from the front paws. No response was noted to prolonged therapy with systemic corticosteroids and antibiotics. Cyclophosphamide therapy was attempted without success. The cat was finally euthanatized.

Gross Pathology. A crusty thickening of the skin was evident around the eyes, over the dorsal lateral aspect of the head, around the mouth, over the nose, and on the ears. The skin around the anus and covering the scrotum was roughened and hyperemic. There was crusty thickening of the skin between the toes and the toes were swollen. A caseous green-yellow exudate could be expressed from the third phalynx of many of the toes. No significant internal lesions were found.

Laboratory Results.

1) FeLV test negative 2 months prior to euthanasia.

2) E. coli and Proteus mirabilis were isolated from a toe 2 months prior to necropsy. A yeast (Torulopsis glabrata) was isolated from the exudate expressed from a toe at the time of necropsy.

Contributor's Diagnosis & Comment. Superficial bullous dermatitis and folliculitis, chronic, erosive, acanthotic, acantholytic and hyperkeratotic.

Specific disease: Pemphigus foliaceus.

The distribution of the lesions (i.e. face, ears, paws and anus) is typical of pemphigus foliaceus. Vessicle formation in both the epidermis and hair follicles and the presence of acantholytic cells within the vesicles are typical histologic features of pemphigus foliaceus. The hyperkeratosis, acanthosis, acantholysis, inflammatory cell infiltrates and focal erosion are considered nonspecific changes.

AFIP Diagnosis. Pustules, subcorneal, epidermal and follicular, multifocal, moderate, with acantholysis and minimal to mild subacute dermatitis, skin and footpad (per contributor), domestic shorthair, feline.

Conference Note. Histologic sections vary in that some subcorneal pustules are intact and contain variable numbers of neutrophils and acantholytic cells while others have ruptured and are empty. Acantholysis, and even occasional pustules, are present in many hair follicles.

The differential diagnosis for the presence of subcorneal epidermal pustules includes pemphigus foliaceous and pemphigus erythematosis, subcorneal pustular dermatosis, and impetigo contagiosa. Subcorneal pustular dermatosis does not involve hair follicles, a feature seen in this case, and afflicted animals are usually very pruritic; pruritis was not noted in this cat. Impetigo is indistinguishable histologically from subcorneal pustular dermatosis and does not involve hair follicles. Staphlococci and streptococci are often not seen within the lesion. Pemphigus foliaceus and erythematosis are indistinguishable except that the latter is usually restricted to the head, unlike the lesions in this case. Scott, and co-workers (1980) reported the presence of subcorneal pustules in two cats (and one dog) with systemic lupus erythematosus. Mueller, Kirk and Scott (1983) further state in some canine and feline cases of pemphigus foliaceous,

deposition of immunoglobulin in the basement membrane zone is accompanied by a positive anti-nuclear antibody (ANA); this has prompted some workers to contemplate the existence of a crossover syndrome between pemphigus and lupus erythematosus.

The unresponsiveness of this cat to immunosuppression caused some participants to question a diagnosis of pemphigus. However, historically feline pemphigus foliaceus and erythematosus are characterized by refractoriness to routine doses of corticosteroids (Manning et al., 1982). Involvement of the nail beds, as in this case, is more characteristic of pemphigus vulgaris.

The Department of Dermatopathology concurred with a diagnosis of pemphigus foliaceous and offered a differential diagnosis of subcorneal pustular dermatosis and impetigo contagiosa.

Contributor. New Mexico Veterinary Diagnostic Services, 700 Camino de Salud, NE, Albuquerque, New Mexico 87106.

Suggested reading.

Ackerman, L. J.: Canine and feline pemphigus and pemphigoid. Part 1. Pemphigus. Comp. Cont. Educ. 7(2): 89-94, 1985.

Caciolo, P. L., Nesbitt, G. H., and Hurvitz, A. I.: Pemphigus foliaceus in eight cats and results of induction therapy using azathioprine. J. Am. Anim. Hosp. Assoc. 20: 571-577, 1984.

Manning, T. O., Scott, D. W., Smith, C. A. et al.: Pemphigus diseases in the feline: Seven case reports and discussion. J. Am. Anim. Hosp. Assoc. 18: 433-443, 1982.

Muller, G. H., Kirk, R. W., and Scott, D. W.: Animal Dermatology, W. B. Saunders Co., 1983, pp. 448-463.

Scott, D. W., Wolfe, M. J., and Lewis, R. M.: The comparative pathology of non-viral bullous skin diseases in domestic animals. Vet. Path. 17: 257-281, 1980.

Case IV - A84-75 (AFIP 1947834).

History. Tissue from a 10-year-old spayed female domestic shorthair cat. Non-healing cutaneous sores near the base of the tail had been present for about two months. Physical findings included 2 firm ulcerated skin lesions near the base of the tail, pitting edema of the rear legs, and a firm, fibrous band leading to the ventral abdominal wall which restricted rear limb movement.

Contributor's Diagnosis & Comment. Malignant basal cell tumor with vascular invasion and desmoplasia, feline. The tumor originated from the skin at the base of the tail. The fibrous tissue palpated in the ventral abdominal wall was due to desmoplasia accompanying lymphatic metastases. There were metastases to regional lymph nodes, lungs, and skeletal muscle.

Basal cell tumors are generally considered to be benign neoplasms. However, 8 of 81 basal cell tumors in cats seen at AMAH had histologic features indicative of malignancy. Features indicative of malignancy included stromal and capsular invasion (8), desmoplasia (8), foci of necrosis (8), mitotic index of 2 or greater per HPF (8), vascular invasion (4), and metastasis in a regional node (1). Of the 81 basal cell tumors, 22% were cystic, 40% were ulcerated, and 50% were pigmented. None of the 8 malignant tumors were pigmented or cystic.

AFIP Diagnosis. Carcinoma, with basaloid and hair follicle differentiation, skin, tail base (per contributor), domestic shorthair, feline.

Conference Note. All participants agreed that this is a malignant neoplasm. Nests and cords of neoplastic cells have invaded the subcutis where there is also a severe sclerosing reaction and convincing evidence of vascular (veins and/or lymphatics) invasion. Discussion therefore centered on the histogenesis of the neoplasm. Due to the formation of trabeculae and packets of bland cells delineated by relatively avascular stroma, many participants felt that Merkel cell (trabecular) carcinoma should be in the differential diagnosis. Other participants noted populations of pale cells with abundant cytoplasm, sometimes aligned on connective tissue elements, and others associated with hair follicles, and favored a follicular origin for the neoplasm (particularly tricholemmoma). In some histologic sections, cords of neoplastic cells are emigrating from the basal epidermis into the dermis; this finding, along with the prominant packeting of cells, lead other participants to agree with the contributor's diganosis of malignant basal cell tumor.

Contributor. Angell Memorial Animal Hospital, 350 S. Huntington Avenue, Boston, Massachusetts 02130.

Suggested reading.

Diters, R. W., and Walsh, K. M.: Feline basal cell tumors: A review of 124 cases. Vet. Path. 21: 51-56, 1984.

Goldschmidt, M. H.: Basal- and squamous-cell neoplasms of dogs and cats. Am. J. Dermatopath. 6(2): 199-206, 1984.

Macy, D. W., and Reynolds, H. A.: The incidence, characteristics and clinical management of skin tumors of cats. J. Am. Anim. Hosp. Assoc. 17: 1026-1034, 1981.

Moulton, J. E. (Ed.): Tumors in Domestic Animals, Univ. of California Press, Berkeley, pp. 47-51.

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Results
AFIP Wednesday Slide Conference - No. 28
8 May 1985

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Case I - 80650 (AFIP 1910089). (2 kodachrome slides)

History. Tissue from a 19-year-old quarter horse mare with a history of progressive weight loss and ulcerative coronitis.

Gross Pathology. There was ulceration of the coronary band on all feet. There was diffuse ulcerative colitis and typhilitis. There were several 1-3 cm firm nodules in the pancreas. There was patchy fibrosis noted grossly in the liver. There were a few granuloma in the liver.

Laboratory Results. There was no eosinophilia, and the serum protein profile was normal. There was a moderate increase in serum alkaline phosphatase.

Contributor's Diagnosis & Comment. Chronic fibrosing pancreatitis with granuloma formation, ductal hyperplasia, and eosinophil infiltration. Presumptive Strongylus equinus migration.

This pancreatic lesion was an incidental finding at necropsy. Although S. equinus frequently migrates to the pancreas the agent induces a minimal lesion. The extensive involvement of the pancreas seen grossly was unusual. Histologically the features normally associated with parasite migration (fibrosis, eosinophils, granulomas and parenchymal loss) were noted, and in addition there was a tremendous hyperplasia of the pancreatic ducts.

This horse also had a diffuse ulcerative colitis and typhlitis with a heavy infiltrate of eosinophils in the submucosa. In areas, there was an exudate of eosinophils on the ulcerated mucosal surface. There was a heavy mixed mononuclear cell infiltrate around mucosal vessels of the large bowel. There was bile duct hyperplasia and fibrosis with parasitic granuloma formation in the liver. The composite of lesions is similar to that described as chronic eosinophilic gastroenteritis in horses. Our case certainly supports the hypothesis that such generalized lesions are manifestations of a hypersensitivity to parasitic antigens.

AFIP Diagnosis. Pancreatitis, eosinophilic and fibrosing, focally extensive, severe, with eosinophilic granulomas, pancreas, quarter horse, equine; etiology--compatible with Strongylus equinus migration.

Conference Note. In addition to changes noted in the morphologic diagnosis, many sections contained ectatic interlobular ducts surrounded by inflammation and fibrosis. There was discussion as to whether the epithelium is hyperplastic or whether the apparent hyperplasia is artifactual. The moderator commented that, in sections of pancreatic duct adjacent to its juncture with the duodenum, the morphology of the duct is complex and is thus easily misinterpreted.

In the gross photographs, one tissue can be tentatively identified as pancreas due to the presence of some lobulation at the apex. The large white nodules represent periductular fibrosis and inflammation. In the colon, numerous ulcerations are present and the greenish discoloration of much of the remaining mucosa suggests the presence of granulocytes.

This case is considered to be typical of chronic pancreatitis resulting from S. equinus migration. This parasite also migrates through the abdominal cavity and liver. Chronic pancreatitis in the horse is usually subclinical and often remains so until there is fibrotic replacement of the islets of Langerhans. Unlike other species, pancreatic exocrine secretions of the horse are not thought to be highly important in digestion, but may be important in providing a medium for ion exchange in the terminal ileum (Morris, 1983). The various skin disorders often accompanying equine chronic pancreatitis (and other forms of GI disease), are thought to result from a defect in essential fatty acid absorption (Rooney, 1985).

This case of chronic eosinophilic pancreatitis and ulcerative colitis in a horse was recently reported by Breider, Kiely, and Edwards (1985).

Contributor. Department of Veterinary Pathology, College of Veterinary Medicine, College Station, Texas 77843.

Suggested reading.

Baker, R. H.: Acute necrotizing pancreatitis in a horse. J. Am. Vet. Med. Assoc. 172(3): 268-270, 1978.

Breider, M. A., Kiely, R. G., and Edwards, J. F.: Chronic eosinophilic pancreatitis and ulcerative colitis in a horse. J. Am. Vet. Med. Assoc. 186(8): 809-811, 1985.

Bulgin, M. S., and Anderson, B. C.: Verminous arteritis and pancreatic necrosis with diabetes mellitus in a pony. Comp. Cont. Educ. 5(9): S482-S485, 1983.

Morris, D. D.: Chronic pancreatitis. In Current Therapy in Equine Medicine, W. B. Saunders Co., 1983, pp. 253-254.

Rooney, J. R.: Autopsy of the Horse, Williams & Wilkins Co., Baltimore, 1970, pp. 69-70.

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Case II - 4265-83 (AFIP 1894683).

History. This 3-month-old Arabian filly was presented to teaching hospital with history of progressive abdominal distension and recurrent colic of 3 days duration. Diarrhea was observed intermittently. Colic became protracted and severe. The filly was euthanatized.

Gross Pathology. Approximately 15 to 20 liters of cloudy, red fluid containing fibrin tags was present in the abdominal cavity. A 32x27x27 cm, 7 kg, tan-yellow mass was present in the ventral abdomen. It was attached to the distal end of the right uterine horn. The mass was multilobulated. Fluid filled cysts were observed on the surface as well as on the cut surfaces. Gritty material was palpated in some areas. There was 360° volvulus of the mass involving the ovarian ligament, mesovarium and broad ligament.

Laboratory Results. Clinical pathology at hospital admission:

Hematology:	
Hemoglobin	16.2 g/dl
PCV	42%
RBC	13.84 x $10^6/mm^3$
WBC	25.1 x $10^3/mm^3$
Seg.	26% 19,076/mm^3
Lymph	24% 6,024/mm^3
Platelets	Adequate
Plasma protein	5.1 g/dl
Fibrinogen	600 mg/dl
Chemistry:	
BUN	19.6 mg/dl
Total protein	3.6 g/dl
Albumin	1.07 g/dl
Bilirubin, total	3.2 mg/dl
Alk. Phos.	140 IU/L
Gamma GT	11.0 IU/L
SGOT	105 IU/L
Sodium	138 Meq/L
Potassium	3.64 Meq/L
Chloride	108 Meq/L
Calcium	9.5 mg/dl
Phosphorous	5.85 mg/dl
Magnesium	1.3 mg/dl
Abdominal Fluid:	
PCV	2.25%
Plasma protein	2.6 g/dl
Cytology	
Red, cloudy	
pH 6	
Spec. gravity	1.020
Tot. prot.	2.7 g/dl
Cell count	1.0 x 10^3
Differential	Set 24%
	Lymph 12%
	Mononuclear 64%
A few bacteria (bacilli)	

Histopathology:

Ovarian neoplasm:

Masses of cells with epithelial appearance are present. In some areas rosette, follicular and cyst formation are observed. The epithelial-like cells have round nuclei with varying amounts of slightly basophilic cytoplasm thus resembling granulosa cells. Amorphous, basophilic material probably representing mucin is present within the follicles and cysts. The neoplastic granulosa cells are supported by stroma composed of prominent plumb spindle shaped cells with foamy cytoplasm resembling theca cells. Connective tissue and vessels are intermixed.

Contributor's Diagnosis & Comment. Granulosa theca cell tumor, right ovary, Arabian, equine.

The morphology of this ovarian tumor is more consistent with granulosa theca cell tumor. Black, intracytoplasmic granules were observed in a small number of the theca-like cells of this neoplasm when post formalin, osmium tetroxide fixed sections were examined. Theca cells do contain fat droplets and steroids. Granulosa cell tumors are the most common ovarian tumor in the adult equine. They are uncommon in young animals and human beings and have not been reported in the young equine. Publication of this case is in process.

These tumors have the capacity to form hormonally active steroids; metastasis is reported. No evidence for hormonal effects or metastasis were present in this case. It was thought that the 360° volvulus resulted in the severe ascitis and colic.

AFIP Diagnosis. Granulosa cell tumor, juvenile type, right ovary (per contributor), Arabian, equine.

Conference Note. This neoplasm has several features which support the diagnosis of juvenile granulosa cell tumor including the multiple lobules of variably-sized follicles which are filled with mucinous material and lined by granulosa cells supported by stroma containing a prominent population of theca cells.

Differentially, cystadenomas lack the theca cell component and are generally cystic and papillary, unlike this case. They are uncommon in young animals.

In ovarian tumors of the human female, juvenile granulosa cell tumors are differentiated from the adult type by their more cystic appearance and by the prominent population of thecal cells, many of which are luteinized. The adult type is always potentially malignant but is usually slow growing and not particularly aggressive. Although a smaller percentage of juvenile tumors are malignant (5%), these are much more aggressive than the adult type (Fox, 1985).

Contributor. School of Veterinary Medicine, Oregeon State University, Corvallis, Oregon 97331.

Suggested reading.

Bergeron, H., Crouch, G. M., and Bowen, J. M.: Granulosa theca cell tumor in a mare. Comp. Cont. Educ. 5(3): S141-S144, 1983.

Fox, H.: Sex cord-stromal tumours of the ovary. J. Pathol. 145: 127-148, 1985.

Hughes, J. P., Stabenfeldt, G. H., and Kennedy, P. C.: The estrous cycle and selected functional and pathologic ovarian abnormalities in the mare. Vet. Clinics No. Amer. 2(2): 225-239, 1980.

Moulton, J. E. (Ed.): Tumors in Domestic Animals, Univ. Calif. Press, Berkeley, 1978, pp. 331-336.

Case III - 83-1155B (AFIP 1941253). (3 kodachrome slides)

History. This 90-week-old bird was from a flock of 21,300 layers that had experienced an 8% mortality and a drop in egg production from 58% to 19% over the past seven days.

Gross Pathology. Depressed birds with comb lesions were selected for examination. Combs, eyelids and wattles were mildly to severely edematous. On some severely edematous combs there were multiple round rough brown depressed areas. In some birds the scales of the shank or the tracheal mucosa were hyperemic, or the esophageal mucosa was petechiated. Egg yolk peritonitis was frequent.

Laboratory Results. The standard technique was used for determining the presence of influenza virus, i.e. the inoculation of chick embryos, testing of allantoic cavity fluid for hemagglutinating activity, examination of chorio-allantoic membranes for the presence of type A internal antigen by an agar gel precipitin test. Influenza virus was identified in blood, brain, comb, heart, kidney, lung, pancreas, proventriculus, trachea, turbinates and liver of this bird. The isolate was subtyped as H5N2 by the National Veterinary Services Laboratory.

Contributor's Diagnoses & Comment. 1) Severe, acute, multifocal coalescing necrotizing pancreatitis. 2) Mild, diffuse, granulomatous peritonitis.

Etiologic Diagnoses: 1) Avian influenza virus infection. 2) Egg yolk peritonitis.

This flock was involved in the epornitic of highly pathogenic avian influenza virus infection that occurred in Pennsylvania in 1983-84. The lesions most frequently seen were nonsuppurative encephalitis, subacute myocarditis, necrotizing pancreatitis and necrotizing myositis. The pancreatitis varied between birds from very mild to severe. In mildly affected pancreases, the inflammation was multifocal and in the exocrine areas most distant from the islets. In the more severely affected pancreases the focal lesions had coalesced so that only the islets and a surrounding zone of exocrine tissue were spared. Such is the case in the tissue submitted, although islets are rare or not present in some sections. Acinar cells are replaced by vacuoles containing an eosinophilic globule or irregular eosinophilic granules and chromatin debris. Small numbers of heterophils and mild edema are present in the affected parenchyma. In some islets there are pale eosinophilic single or multiple intranuclear inclusions.

AFIP Diagnoses. 1) Pancreatitis, necrotizing, acute to subacute, multifocal and coalescing, severe, pancreas, breed unspecified, chicken, avian; etiology--compatible with orthomyxovirus (avian influenza). 2) Peritonitis, granulomatous, diffuse, moderate, pancreatic mesenteric attachment; etiology--compatible with a reaction to free yoke material in the peritoneal cavity.

Conference Note. In some sections, participants noted intranuclear structures thought to be inclusion bodies within cells of islets of Langerhans. However, the moderator, who contributed this case, said that not all sections contain islets, thus, inclusion bodies are not present in many sections. In a paper recently published by the moderator (Acland, Silverman, Bachin, and Eckroade, 1984), it is noted that immunospecific staining consistently occurs in the nuclei of chick embryo cells infected with the influenza virus. While inclusion bodies are not typical of influenza viral infection of any species, perhaps their presence in this case reflects sequestration of viral protein in the nucleus as is sometimes seen in canine distemper virus infection.

The differential diagnosis for the gross lesions present in the kodachrome slides included velogenic viscerotropic Newcastle's disease, although participants thought that pancreatitis was rarely if ever seen in that disease. Participants further thought that there was no good differential diagnosis for the histologic lesions present in this case. In some of the older literature on avian influenza, however, pancreatitis is not a constant finding.

In some sections, more chronic areas of acinar degeneration and fibrosis suggest that the more acute lesions of avian influenza are superimposed on an unrelated chronic condition.

Contributor. Laboratories of Large Animal Pathology and Poultry Pathology, University of Pennsylania, New Bolton Center, Kennett Square, Pennsulvania 19348.

Suggested reading.

Acland, H. M., Silverman Bachin, L. A., and Eckroade, R. J.: Lesions in broiler and layer chickens in an outbreak of highly pathogenic avian influenza virus infection. Vet. Path. 21: 564-569, 1984.

Beaudette, F. R., Hudson, C. B., and Saxe, A. H.: An outbreak of fowl plague in New Jersey in 1929. J. Agricul. Res. 49(1): 83-92, 1934.

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Narayan, O., Lang, G., and Rouse, B. T.: A new influenza A virus infection in turkeys. Archiv Virusforschung 26: 166-182, 1969.

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Uys, C. J., and Becker, W. B.: J. Comp. Path. 77: 167-172, 1967.

Case IV - N83--852 (AFIP 1902492).

History. Tissue from a 4-year-old quarter horse stallion with a 5-1/2 month history of diarrhea and progressive weight loss. Feces remained as cowpie-like despite therapy. Weight loss was especially rapid for 4 weeks prior to euthanasia and necropsy. The horse was treated with Ivermectins and corticosteroids.

Gross Pathology. The glandular portion of the gastric wall was diffusely thickened by submucosal, edematous, white tissue and hyperplasia of the mucosa which formed firm nodular masses interrupted only by linear fissures and small areas of ulceration. The pylorus was very distended, immobile and firm with similar wall thickening. The duodenum and to a lesser extent the upper jejunum were dilated and firm with thickening and rigidity of the walls circumferentially by submucosal fibrosis and edema. The mucosa of these areas was multifocally hyperplastic and nodular or ulcerated and covered with a yellow diphtheritic membrane. The intestinal content was of fluid consistency but otherwise normal. The large colon walls were diffusely edematous with a few small areas of mucosal thickening and nodularity in the large colon and cecum. The lower jejunum and ileum were flaccid but otherwise normal. The small colon wall was moderately thickened and focally ulcerated.

Intestinal lymph nodes were enlarged and edematous.

No gross evidence of gastrointestinal parasitism was present.

Laboratory Results. Clinical pathologic studies repeatedly revealed hypoproteinemia and terminally a lymphocytosis. Serum enzymes were normal. Intestinal function tests showed decreased glucose tolerance, xylose absorption and starch absorption tests. Bone marrow aspirates showed hyperplasia of the eosinophilic and basophilic series. Numerous fecal cultures were repeatedly negative for Salmonella spp., Strongyle spp. ova and other pathogenic microorganisms. A laparotomy revealed enlarged colon and mesenteric lymph nodes, distended colonic serosal lymphatics and moderate edema of the colonic wall. In addition, a firm mass was palpable in the region of the pylorus.

Contributor's Diagnosis & Comment. Chronic, active, ulcerative and eosinophilic gastroenteritis with eosinophilic granulomas, submucosal and mucosal fibrosis, glandular hyperplasia, arteriosclerosis and vascular intimal body formations.

Additional diagnoses included lymphocytic colitis, typhilitis and proctitis, bone marrow eosinophilic and basophilic series hyperplasia, intra-abdominal hyperplastic lymphadenopathy and focal ulcerative dermatitis of the pastern regions.

The etiology is unknown but lesions are suggestive of a persistent or intermittent hypersensitivity reaction to some feed related antigen or to parasites.

The slide submitted is taken from approximately the middle of the duodenum and is representative of the histopathologic changes as seen in the stomach, pylorus, duodenum and multifocally in the upper jejunum, colon and cecum. The accumulations of eosinophils surrounded by giant cells, macrophages and epithelioid cells, referred to here as "eosinophilic granulomas" have been described in a variety of parasitic conditions in horses, etc., but are also seen in some other immune-mediated conditions such as in "eosinophilic granuloma" of the lip of dogs and cats. The location of these granulomas varies from the lamina propria to intra-glandular to submucosal and do not contain larvae or other structures to suggest their etiology.

Another prominent feature of this case is the large numbers of Russell bodies in plasma cells, again of unknown signficance. It is presumed that the extensive intestinal and gastric wall fibrosis is a result of chronic edema.

The pathologic features of this case suggest an immune-mediated pathogenesis, possibly involving an on-going type I hypersensitivity reaction to a feed allergen or parasites. The large numbers of mast cells and eosinophils in the gastrointestinal tissues, and bone marrow eosinophilic and basophilic hyperplasia would also correlate with this suggested pathogenesis. The vascular lesions are probably from released vaso-active amines locally in the tissues.

Two other similar cases with somewhat similar lesions have been seen in horses in the last three years in our laboratory. The lesions are similar to those described by Dr. A. Pass and J. R. Bolton as referenced below and to our knowledge is the only report of this condition in the veterinary literature.

The contributor would welcome any further contributions and comments on our suggested etiologies and pathogenesis.

AFIP Diagnosis. Enteritis, granulomatous, eosinophilic, chronic, diffuse, moderate to severe, with eosinophilic granulomas, mucosa and submucosa, small intestine, quarter horse, equine.

Conference Note. Histologic changes present in this case suggest that eosinophilic granulomas arise in the glands of the deep submucosa (Brunner's glands). Eosinophils may aggregate within these glands, and by release of their proteolytic enzymes, destroy the epithelium lining the glands. Macrophages are drawn to these areas where they surround the gland and form occasional multinucleated giant cells through syncytiation.

Focal erosions of the mucosa are present, but none of these is seen to breech the muscularis mucosa. Additionally, some villi in many of the sections are atrophied.

The Department of Gastrointestinal Pathology agrees that eosinophilic granulomas appear to involve Brunner's glands. They note that, although there is a form of eosinophilic gastroenteritis in humans, eosinophilic granulomas or abscesses are not a feature of the disease in man.

Chronic eosinophilic enteritis of horses has been described in Australia as a distinct syndrome. In a report of four equine cases, and a discussion of similar conditions in other species, Pass and Bolton (1982) suggest that eosinophilic gastroenteritis in the dog and in man is not a simple allergic reaction within the gut. This is because the process cannot be reversed by the removal of the suspected offending foods. Instead, they believe, the condition is a self-perpetuating process of unknown initial cause that is exacerbated by certain foods. The condition in the horse, they believe, may be similar to the one in man. The lesions suggest an ongoing process against an unknown antigen which has been either ingested or secreted into the gut.

The same authors, with Mills (1984) described a case of basophilic enterocolitis in a horse; that condition shares many similar features with the eosinophilic form.

Contributor. Department of Veterinary Pathology, University of Saskatchewan, Saskatoon, Saskatchewan, Canada.

Suggested reading.

Jubb, K.V.F., Kennedy, P. C., and Palmer, N.: Pathology of Domestic Animals, 3rd Ed., Vol. 2, Academic Press, 1985, pp. 75-77.

Lindberg, R.: Pathology of equine granulomatous enteritis. J. Comp. Path. 94: 233-247, 1984.

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Quigley, P. J., and Henry, K.: Eosinophilic enteritis in the dog: A case report with a brief review of the literature. J. Comp. Path. 91: 387-392, 1981.

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Results
AFIP Wednesday Slide Conference - No. 29
15 May 1985

Conference Moderator: Diane E. Gunson, PhD, BVSc, MRCVS
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Case I - 83-105 (AFIP 1899159).

History. Tissue from a 1-year-old standardbred male horse. This colt developed limb edema two weeks prior to presentation and was treated with Kanamycin. Ten days later it began bleeding from venipuncture sites and from the mouth. There were petechiae on the sclera and oral membranes with bleeding from the nose and mouth.

Gross Pathology. The yearling was emaciated.
Stomach: There were heavy infestations of Gastrophilus sp. and Draschia sp.
Small intestine: Severe Parascaris equorum infestation.
Cecum: Mild Anoplocephala infestation.

Laboratory Results.
P.C.V. = 5% platelet count 7000/ul
WBC = 14,000/mm^3 with 31% eosinophils including many immature forms

Contributor's Diagnosis & Comment. Myelophthisis with neoplastic eosinophil precursors. Eosinophilic leukemia.

Although normal erythroid precursors, neutrophil precursors and megakaryocytes are present, there is an over abundance of eosinophilic precursor cells, many with abnormal nuclei and cytoplasmic granules. Many are oversized and contain multiple nuclei. The abnormal cells were positive with the Luna stain (for eosinophils) and Sudan black (for granulocytes).

AFIP Diagnosis. Myeloproliferative disease consistent with eosinophilic leukemia, bone marrow, standardbred, equine.

Conference Note. In the bone marrow of this case, myeloid elements greatly outnumber erythroid; this finding suggests a myelophthisic condition which is further supported by the leukocytosis and the severe thrombocytopenia and anemia seen in this case. The predominant cell type resembles an atypical eosinophil. Participants noted some cells in which there is extreme variation in the size of granules. In still other cells, granules are of normal size for a mature cell but nuclei in such cells are large, not well-segmented, and more typical of an immature cell. This asynchrony of maturation of the cytoplasm and nucleus is often a feature of neoplastic cells.

Myeloproliferative disorders are rare in the horse; the report of this case (Morris, Bloom, Roby et al., 1984) is only the fourth of myelogenous leukemia, with only one report of erythrocytosis. The above cited report contains a good review of eosinophilic disorders in man and domestic animals.

Contributor. New Bolton Center, University of Pennsylvania, 382 West Street Road, Kennett Square, Pennsylvania 19348.

Suggested reading.

Brumbaugh, G. W., Stitzel, K. A., Zinkl, J. G. et al.: Myelomonocytic myeloproliferative disease in a horse. J. Am. Vet. Med. Assoc. 180(3): 313-316, 1982.

Lewis, H. B., and Leitch, M. A.: A case of granulocytic leukemia in the horse. Proc. Inter. Symp. Equine Hematol. Am. Assoc. Equine Pract. 1: 141-143, 1975.

Morris, D. D., Bloom, J. C., Roby, K.A.W. et al.: Eosinophilic myeloproliferative disorder in a horse. J. Am. Vet. Med. Assoc. 185(9): 993-996, 1984.

Searcy, G. P., and Orr, J. P.: Chronic granulocytic leukemia in a horse. Can. Vet. J. 22: 148-151, 1981.

Case II - 2988-84 (AFIP 1946317). (1 kodachrome slide)

History. Tissue from a 4-day-old thoroughbred. This foal presented with a bloody diarrhea (frank blood) 12 hours prior to death. Last year, a similar condition affected one foal from this same farm.

Gross Pathology. Serosanguinous fluid intermixed with clotted blood filled 4-5 meters of the mid-small intestine. This intestinal wall was markedly thickened with a necrotic yellow granular membrane, abundant edema and hemorrhage. The serosal surface was dark red and at the proximal and distal margins hemorrhagic streaks were evident. The remaining portion of the distal small intestines and the entire colon contained clotted blood within their lumen and the mucosa was deep red. Multifocal areas of dark red mottling was present in the liver.

Laboratory Results. *Clostridium perfringens* type C toxin was confirmed by mouse neutralization tests following the procedures of Sterne and Batty.

Contributor's Diagnosis & Comment. Acute, diffuse, severe, necrohemorrhagic enteritis with vascular fibrinoid necrosis.

The majority of the morphological changes in the intestines are due to the *Clostridium perfringens* and its toxins because the foal was necropsied immediately following death and the tissues were placed in 10% buffered formalin.

A Brown and Hopp's stained histological section revealed massive numbers of large bacterial rods, suggestive of *Clostridium* species. Histological

changes in other organs included: multifocal coagulative necrosis of a mesenteric lymph node, mild hepatic vacuolar change, and hepatic and renal congestion.

This foal had little milk in its stomach nor was there retrospective history that the mare was a heavy milker. No evidence of intestinal emphysema was present as commonly occurs in piglets.

AFIP Diagnosis. Enteritis, necrohemorrhagic, acute, diffuse, severe, with superficial mucosal bacilli, and vascular fibrinoid change, thoroughbred, equine; condition--consistent with clostridial enterotoxemia.

Conference Note. The discussion centered on vascular changes in the submucosa. In most vessels, the various layers of the wall are separated by a pink material (edema fluid) imparting a hyaline appearance. Some participants speculated that in some arterioles, the hyaline change appears due to the intensely eosinophilic cytoplasm of swollen smooth muscle cells resembling sacs of edema fluid. In many of these vessels, fibrin is precipitated on the vessel wall.

In a smaller proportion of vessels, however, nuclei of some medial smooth muscle cells are pyknotic and scattered neutrophils are also present. In these vessels, the term fibrinoid necrosis was preferred to describe the change. The moderator preferred the term leukoclastic vasculitis, in which the initial stage is fibrinoid necrosis, and likened the changes in the vessels of this foal with those described in a horse with anaphylactoid purpura (Gunson, Rooney, 1977).

Participants speculated as to the identity of clusters of fairly large mononuclear cells within the submucosa. To some, they resemble neurons of the parasympathetic ganglia. In some areas, however, they assume a linear arrangement as if associated with a vessel. Some participants thought they may be hypertrophic crypt epithelial cells. The Department of Gastrointestinal Pathology believes that these cells are neurons of Meissner's plexus. They further comment that these cells appear immature in comparison to neurons in the myenteric plexus.

The various diseases associated with Clostridium perfringens enterotoxemia were discussed. The moderator stressed the importance of examining the gut immediately, as autolysis occurs rapidly affecting the tips of the villi first, and masking lesions there.

Contributor.

Barker, I. K., and Van Dreumel, A. A.: The alimentary system. In Pathology of Domestic Animals, 3rd Ed., Jubb, K.V.F., Kennedy, P. C. and Palmer, N., Academic Press, 1985, Vol 2, pp. 149-155.

Dickie, C. W., Klinkerman, D. L., and Petrie, R. J.: Enterotoxemia in two foals. J. Am. Vet. Med. Assoc. 173(3): 306-307, 1978.

Gunson, D. E., and Rooney, J. R.: Anaphylactoid purpura in a horse. Vet. Path. 14: 325-331, 1977.

Nilo, L., and Chalmers, G. A.: Hemorrhagic enterotoxemia caused by Clostridium perfringens type C in a foal. Can. Vet. J. 23: 299-301, 1982.
Nilo, L.: Clostridium perfringens in animal disease: A review of current knowledge. Can. Vet. J. 21: 141-148, 1980.
Ochoa, R., and Kern, S. R.: The effects of Clostridium perfringens type A enterotoxin in Shetland ponies -- clinical, morphologic and clinicopathologic changes. Vet. Path. 17: 738-747, 1980.

Case III - 83-581 (AFIP 1957368).

History. Tissue from an adult equine. Two tumors appeared on the head of the horse, one below the medial canthus of each eye. The horse would scratch these tumors until they bled. Both tumors were removed surgically and submitted for histopathology.

Gross Pathology. The growth removed from the left side measured 1/2 to 1 cm in diameter and the growth from below the right eye was 2-3 cm in diameter.

Contributor's Diagnosis & Comment. Dermatitis, proliferative, eosinophilic, severe, locally extensive, skin, medial canthuses, equine.
Etiologic diagnosis: Cutaneous habronemiasis.
Etiology: Habronema spp.

The lesions of cutaneous habronemiasis are due to the activity of aberrently situated larvae of Habronema spp. equine stomach worms, especially Draschia megastoma. The third stage larvae of these nematodes are usually deposited by the common house fly (Muscae domestica) or by the stable fly (Stomoxis calcitrans). These larvae may then penetrate deeply into the dermis of mucous membranes or open wounds where they elicit a granulomatous response with abundant eosinophils. The granulations usually begin suddenly, grow rapidly, bleed freely, and show little tendency to heal. Larvae remnants may be seen as small flecks in caseous necrotic foci composed of degenerate eosinophils.

The lesion is usually composed of highly vascular granulation tissue infiltrated by a nearly pure population of eosinophils. Occasional giant cells may be found near the larvae and neutrophils predominate at the ulcerated surface.

AFIP Diagnosis. Dermatitis, ulcerative, eosinophilic and granulomatous, diffuse, severe, with focal eosinophilic granulomas containing nematode larvae, skin, breed unspecified, equine; condition--compatible with habronemiasis.

Conference Note. The parasites within dermal eosinophilic granulomas have a body cavity, coelomyarian musculature, and an intestinal tract, identifying them as nematodes. Since reproductive organs are not present in any parsites examined, it may be assumed they are larvae rather than adults.

The microscopic differential diagnosis includes nodular necrobiosis, habronemiasis, hypodermiasis, and infection by fungus such as Pythium spp. Occasionally, multiple sections are needed to confirm the presence of nematode larvae. Since Habronema spp. and Draschia megastoma frequently invade wounds of the prepuce and penis, resultant lesions must be differentiated grossly from squamous cell carcinoma and sarcoid.

The normal life cycle of these parasites involves deposition of 3rd stage larvae around the mouth of the horse; they are eventually swallowed and their life cycle is completed. Occasionally larvae make their way into the nostrils, are inhaled, and pulmonary habronemiasis results. The moderator, who has studied numerous cases of equine exercise-induced pulmonary hemorrhage, demonstrated several cases of the latter with peribronchiolar and periarteriolar eosinophilic infiltrates. She hypothesizes that there is pulmonary vascular damage, perhaps the result of Habronema spp. infection, which predisposes horses to pulmonary hemorrhage when under physiologic stress.

Contributor. Veterinary Research Institute, Onderstepoort, Republic of South Africa.

Suggested reading.

Lyons, E. T., Drudge, J. H., Tolliver, S. C. et al.: Prevalence of Anoplocephala perfoliata and lesions of Draschia megastoma in thoroughbreds in Kentucky at necropsy. Am. J. Vet. Res. 45(5): 996-999, 1984.

Mayhew, I. G., Lichtenfels, J. R., Greiner, E. C. et al.: Migration of a spiruroid nematode through the brain of a horse. J. Am. Vet. Med. Assoc. 180(11): 1306-1311, 1982.

Montes, L. F., and Vaughan, J. T.: Skin Diseases of the Horse. W. B. Saunders Co., philadelphia, 1983, pp. 1104-1111.

Rebhun, W. C., Mirro, E. J., Georgi, M. E. et al.: Habronemic blepharoconjunctivitis in horses. J. Am. Vet. Med. Assoc. 179(5): 469-472, 1981.

Case IV - N-84-343 (AFIP 1947992).

History. Tissue from a 5-day-old male quarter horse. The foal appeared normal at birth but developed signs of colic which improved. The abdomen became distended with what was identified as urine. The foal died during surgery to repair the ruptured urinary bladder.

Contributor's Diagnosis & Comment. Testis - physiologic involution (normal).

The section is of a normal 5-day-old foal testis. The seminiferous tubules are lined primarily by undifferentiated cells and occasional spermatogonia. The interstitium contains abundant large oval cells (interstitial cells?) whose cytoplasm is distended by granular light brown pigment (lipofuscin).

By the 60th day of gestation the fetal gonads of the horse have enlarged greatly and are composed largely of hypertrophied, hyperplastic interstitial cells. The interstitial cell hyperplasia reaches its peak around day 250. Degenerative changes (involution) begins to appear in the interstitial cells by day 300 and the size of the gonads diminish greatly by birth.

The marked hypertrophy and hyperplasia of fetal gonadal interstitial cells followed by involution is apparently unique to the family Equidae.

AFIP Diagnosis. Essentially normal tissue, testis, quarter horse, equine.

Conference Note. The moderator showed several sections of testis from equine fetuses of varying gestational age. In younger fetuses the testis contains sheets of interstitial cells with intensely eosinophilic cytoplasms, which closely resemble hepatocytes histologically. Interstitial cell development peaks at approximately 60 days of gestation. At approximately 250 days of gestation, these cells begin to degenerate, and the brown pigment granules appear in their cytoplasm. In the younger fetus, however, the presence of numerous pink polygonal cells, with a few scattered seminiferous tubules, can be mistaken for liver. Several participants reported having necropsied young pigs with pieces of testicular tissues seeded about the peritoneum; they commented that these are easily mistaken for ectopic liver.

It has been observed that the massive interstitial cell development in the fetal testis corresponds with ultrastructural observations of increased smooth endoplasmic reticulum in those cells, prompting investigators to speculate the cells are involved in steroid synthesis (Gonzalez-Angulo, Hernandez-Jauregui, Martinez-Zedilo, 1975).

Contributor. College of Veterinary Medicine, Mississippi State University, Mississippi State, Mississippi 39762.

Suggested reading.

Hay, M. F., and Allen, W. R.: J. Reprod. Fert., Suppl 23, 557-561, 1975.

Gonzalez-Angulo, A., Hernandez-Jauregui, P., and Martinez-Zedilo, G.: Fine structure of the gonads of the horse and its functional implications. J. Reprod. Fert., Suppl 23: 563-567, 1975.

Trautmann, A., and Fiebiger, J.: The Histology of Domestic Animals, pp.259-263.

Van Vorstenbosch, C.J.A.H.V., Colenbrander, B., and Wensing, C.J.G.: Leydig cell development in the pig testis during the late fetal and early postnatal period: An electron microscopic study with attention to the influence of fetal decapitation. Am. J. Anatomy 169: 121-136, 1984.

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Results
AFIP Wednesday Slide Conference - No. 30
22 May 1985

Conference Moderator: John M. Pletcher
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Case I - H0836440 (AFIP 1945169).

History. Tissue from a 7-year-old, intact female German shorthair pointer. This dog was examined because of a soft enlargement in the area of the left 3rd mammary gland. The animal was given testosterone. One month later the mass was surgically excised. The surgeon described the mass as having a cystic appearance with multiple pellet-like masses of firm tissue scattered through it.

Contributor's Diagnosis and Comment. Basaloid adenoma of the mammary gland.

Mammary basaloid adenomas have been reported in experimental dogs receiving progestogens for prolonged periods. A recent report describes mammary basaloid adenomas as a naturally occurring entity. The dog in this case received testosterone at the time it was initially examined for a mammary mass, but it had no history of having received progestogens or any other steroids prior to the initial presentation.

Mammary basaloid adenomas are reported to be benign. At our lab, we have seen a few mammary basaloid adenomas which histologically appeared to be more aggressive with apparent stromal invasion. We have also experienced occasional local recurrence of these lesions, but have not documented metastasis.

AFIP Diagnosis. Basaloid adenoma, mammary gland, German shorthair pointer, canine.

Conference Note. Discussion centered on several features of this neoplasm which differ from those described in the two previous reports of canine basaloid adenomas (Kwapien, Giles, Gell, et al., 1977) (Esplin, Bernstein, McLaughlin, 1984). This neoplasm has many foci of squamous change with central keratinization which are suggestive of a hair follicle tumor; in several areas neoplastic cells are extending out of the lobule, invading surrounding connective tissue, presenting a more aggressive appearance than is described for basaloid adenomas. Some participants noted that the neoplasm in this case fits the description of the mammary squamous cell carcinoma in the Bulletin of the World Health Organization (Hampe, Misdorp, 1974).

Personal communication with one of the authors (RCG) of the initial description of canine basaloid adenomas (Kwapien, Giles, Gell, 1977), revealed that the neoplasm in this case probably has more areas of squamous change than the tumors examined in that study, but that the basal cell components are essentially identical. Dr. Giles further stated that he has seen 10-12 similar neoplasms in the past 4 years in bitches with no history of progestogen therapy. Likewise, in several animals which had been treated with progesterones and in whom similar tumors might be expected, no neoplasms were seen. In one spontaneous tumor, the neoplasm was found in a draining lymph node and it is suspected that local extension rather than lymphatic metastasis was the explanation. Dr. Giles suggested that "basaloid tumor" may prove to be more appropriate so that the more aggressive neoplasms could be subdivided as basaloid carcinomas, and the benign neoplasms as basaloid adenomas.

Contributor. Veterinary Reference Laboratory, P.O. Box 30633, Salt Lake City, UT 84130.

Suggested reading.

Esplin, D. G., Bernstein, N. M. and McLaughlin, H.: Basaloid adenoma of the mammary gland in two dogs. J. Am. Vet. Med. Assoc. 184(7): 855-857, 1984.

Giles, R. C.: Personal communication with Col. G. Imes, 30 May 1985.

Hampe, J. F. and Misdorp, W.: Tumors and dysplasias of the mammary gland. Bull. Wld. Hlth. Org. 50: 111-133, 1974.

Kwapien, R. P., Giles, R. C., Gell, R. G. et al.: Basaloid adenomas of the mammary gland in beagle dogs administered investigational contraceptive steroids. J. Natl. Cancer Inst. 59: 933-939, 1977.

Case II - 75N-1446 (AFIP 1902435).

History. Tissue from a 1-year-old Bernese mountain dog. This animal presented with chronic anorexia, weight loss, stertorous respiration, conjunctivitis with prominent chemosis and multiple cutaneous nodules distributed over the entire body, but especially in nasal region, eyelids and scrotum. The clinical course is characterized by remissions and relapses.

Gross Pathology. Necropsy revealed widespread nodular to diffuse lesions in lung, liver, bone marrow, spleen, lymph nodes, kidneys, eyes, testes and various other tissues in addition to the cutaneous lesions seen on clinical examination.

Laboratory Results. Lesions have been cultured for bacteria and fungi; significant organisms were not recovered. Limited virological studies were also nonproductive.

Contributor's Diagnosis and Comment. Systemic histiocytosis.

Special stains were performed on many lesions to screen for possible etiological agents. None were detected. The stains included acid fast, Giemsa, Methenamine Silver, Periodic Acid-Schiff and Brown and Brenn.

The histiocytic nature of the major infiltrating cell type is supported by cytochemical and electron microscopic observations. The cells react strongly for acid phosphatase and nonspecific esterase and have the ultrastructural characteristics of macrophages. The condition is not clearly neoplastic; in fact the episodic nature of the condition would support the notion that it is not neoplastic. The clinical course and the appearance of the lesions resemble those seen in Histiocytosis X of man; however, Birbeck's granules have not been demonstrated in histiocytes in the canine cases.

The condition has only been observed in 5 closely-related Bernese mountain dogs. A genetic basis is suspected but has not been proven.

AFIP Diagnosis. Dermatitis and cellulitis, angiocentric, chronic-active, diffuse, with necrotizing vasculitis and multifocal necrosis, dermis and subcutis, Bernese mountain, canine.

Conference Note. The marked angiocentric distribution of infiltrating mononuclear cells is suggestive of an inflammatory process, yet in some areas the cells infiltrate into muscle and nerves and lack angiocentricity. Although the cells in perivascular spaces share some features with histiocytes, special stains done to clarify their identity were equivocal. Occasionally, vessel walls are infiltrated by these cells; the walls of these vessels are necrotic, and participants related these vascular lesions with the areas of necrosis in the subcutis (i.e. infarction).

This case represents systemic histiocytosis of Bernese mountain dogs which was recently reported by the contributor (Moore, 1984; More and Rosin, 1984). This condition resembles malignant histiocytosis of man and is characterized histologically by infiltration of multiple organs by pleomorphic phagocytic mononuclear cells and multinucleated giant cells. Infiltrates are consistently present in lungs and hilar lymph nodes, and often in the CNS. The clinical course is rapidly progressive (Moore, Rosin, 1984).

Birbeck granules, mentioned in the contributor's comment, are widely accepted as the "sine qua non" for identifying Langerhans cells in the human epidermis. A second cell, which travels in blood and lymph, called the "veil" cell is thought also to be of monocyte origin and will occasionally contain Birbeck granules (Weiss, 1983). Their function remains unclear, and in the opinion of many conference participants these granules are not found in the Langerhans cells of the dog.

Contributor. Department of Veterinary Pathology, School of Veterinary medicine, 1126 Haring Hall, Davis Campus, Davis, CA 95616.

Suggested reading.

Moore, P. F. and Rosin, A.: Malignant histiocytosis of Bernese mountain dogs. Proceedings, 35th Ann. Meeting, Am. College Vet. Pathologists, Nov. 12-16, Toronto, Canada, 1984 p. 28.

Moore, P. F.: Systemic histiocytosis of Bernese mountain dogs. Vet. Pathol. 21: 554-563, 1984.

Scott, D. W., Miller, W. H., Tasker, J. B. et al: Lymphoreticular neoplasia in a dog resembling malignant histiocytosis (histiocytic medullary reticulosis in man). Cornell Vet. 69: 176-197, 1979.

Weiss, L.: Histology; Cell and Tissue Biology, 5th Ed., Elsevier Biomedical, 1983, pp. 535-536, 581.

Case III - 393-84 (AFIP 1946318).

History. Tissue from an 8-month-old female Hereford fetus. This aborted fetus was the eighth abortion to occur in a month in a beef cow herd of 120. All aborted feti were eight to nine months of gestational age. The cows had been present in the same pasture with the same bulls the previous summer, fall, and winter. The herd has had two to three abortions of undetermined etiology each year for the past several years.

Gross Pathology. The lymph nodes, liver, thyroids, and spleen were all moderately enlarged and pale. Petechia and ecchymoses were present in these organs as well as diffusely in the subcutaneous tissues, oral cavity, and conjunctivae. Ascites and anasarca were also present.

Laboratory Results.

Bacteriology: Stomach contents, lung, and liver: No significant isolates.
Spleen: Gimenez stained smears were negative for chlamydia.
Virology: Kidney, liver, spleen: virus isolation: negative.
Kidney: fluorescent antibody: IBA: negative
BVD: positive
Serology: Fetal blood: Bluetongue AGID: negative.
Chemistry: Fetal liver: Copper: 35.7 ppm dry weight.
Selenium: 0.354 ppm dry weight.

Contributor's Diagnoses and Comment. 1. Splenic, hepatic, and renal chronic, diffuse, histiocytic, and lymphocytic vasculitis and perivasculitis. 2. Splenic, acute, multifocal, necrotizing vasculitis. Epizootic bovine abortion (foothill abortion).

The morphologic changes present in the spleen, liver, and kidneys of this bovine fetus are most consistent with epizootic bovine abortion. However, there was evidence for bovine viral diarrhea virus infection as well as copper and selenium deficiency. Epizootic bovine abortion has been primarily reported in California; this case was from a farm in southeastern Oregon. Chlamydial organisms are the presumed etiologic agent but that has not been confirmed.

AFIP Diagnoses. 1. Hepatitis, subacute, portal, diffuse, mild, liver, Hereford fetus, bovine. 2. Splenitis, subacute, diffuse, moderate, with multifocal necrosis and reticuloendothelial proliferation, spleen. 3. Capsulitis, subacute, multifocal, mild, spleen and liver.

Conference Note. Within centrolobular areas of the liver, hepatic cords are disrupted and irregular and sinusoids are dilated. Participants discussed the possible relation between those lesions and passive congestion due to cardiovascular compromise several days prior to fetal death. The loss of centrolobular hepatocytes suggests a chronic process, yet neither fibrosis nor hemosiderosis are present. Jubb, Kennedy, and Palmer (1985) state that fetal hepatic congestion which results from epizootic bovine abortion (EBA) often resembles congestion which occurs in fetuses with cardiac disease.

Participants briefly discussed the histiogenesis of fetal lesions of EBA as proposed by Kennedy, Casaro, Kimsey, et al. (1983). Infection with the agent of EBA, now believed to be a virus, induces a lymphoproliferative response with subsequent infiltration of macrophages. As the fetus matures, plasma cells produce antibody resulting in deposition of antigen-antibody complexes. With further maturation of the fetus, complement is produced which fixes to the antigen-antibody complexes deposited earlier in the disease. This results in necrotizing lesions, often necrotizing vasculitis as is present in some splenic vessels in this case.

In the late stages of the disease, the fetal thymus, not submitted in this case, developes unique changes that characterize this disease; they include severe atrophy of the thymic cortex and infiltration of both cortex and medulla by macrophages. Unlike other diseases causing bovine abortion, the placenta in EBA is normal other than mild edema. Extramedullary hematopoiesis, which is evident in the liver and spleen of this case, is considered normal in a calf of this gestational age (8 months).

Contributor. Veterinary Diagnostic Laboratory, Oregon State University, P.O. Box 429, Corvallis, Oregon 97339-0429.

Suggested reading:

Jubb, K. V. F., Kennedy, P. C. and Palmer, N.: Pathology of Domestic Animals, 3rd Ed., Academic Press, 1985, vol. 3, pp 363-365.

Kennedy, P. C., Casaro, A. P., Kimsey, P. B. et al.: Epizootic bovine abortion: Histogenesis of the fetal lesions. Am. J. Vet. Res. 44(6): 1040-1048, 1983.

Kennedy, P. C., Olander, H. J. and Howarth, J. A.: Pathology of epizootic bovine abortion. Cornell Vet 50: 417-429, 1960.

Kimsey, P. B., Kennedy, P. C. and Bushnell, R. B. et al.: Studies on the pathogenesis of epizootic bovine abortion. Am. J. Vet. Res. 44(7): 1266-1271, 1983.

Kwapien, R. P., Lincoln, S. D. and Reed, D. E.: Pathologic changes of placentas from herfers with experimentally induced epizootic bovine abortion. Am. J. Vet. Res. 31(6): 999-1015, 1970.

Case IV - CP 84-29 (AFIP 1948004).

History. Tissue is from an adult DSH cat. No abnormal clinical signs were noted during the animal's use in a chronic exercise study. At the conclusion of the study, the animal was necropsied and a focal lesion was found involving the caudal portion of the right diaphragmatic lobe of the lung.

Contributor's Diagnosis and Comment. Verminous pneumonia and pleuritis, granulomatous. Etiology - Paragonimus kellicotti.

AFIP Diagnosis. Pneumonia, granulomatous, focal, severe, with encysted trematode parasite and eggs, lung, domestic shorthair, feline; etiology--compatible with Paragonimus sp.

Conference Note. Participants thought that the adult parasite was surrounded by granulation tissue and granulomatous inflammation, especially evident surrounding parasite eggs. Numerous eosinophilic abscesses are scattered throughout the lesion.

The parasite can be identified as a trematode because it is flattened, has a tegument with spines, has a pseudocoelom with vitellaria, has paired caeca (not evident on every slide) and an excretory bladder. Egg morphology can be helpful in further identifying the trematode as Paragonimus--the eggs have a seated operculum (flattened at the top with little shoulders extending on either side of it) and a knobby protuberance on the end opposite the operculum. Very few eggs in the sections examined are well enough preserved to make these distinctions. The shape of tegumental spines can also aid in differentiating the species of Paragonimus.

Although they are hermaphroditic, Paragonimus spp prefer to exist in pairs and cross-fertilize. Most of the tissue damage is done when unpaired flukes migrate extensively.

The high degree of association of flukes with the caudal lung lobes is thought to be related to their proximity to the diaphragm through which the flukes migrate from the small intestine. The location of the upper small intestine on the right side of the abdomen is thought responsible for a high incidence of lesions in the caudal right lung lobes (Stromberg, Dubey, 1978).

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Suggested reading.

Ameel, D. J.: Paragonimus, its life history and distribution in North America and its taxonomy (Trematoda): Troglotrematidal). Am. J. Hygiene 19(2): 279-312, 1934.

Bisgard, G. E. and Lewis, R. E.: Paragonimiasis in a dog and a cat. J. Am. Vet. Med. Assoc. 144(5): 501-507, 1964.

Dubey, J. P., Stromberg, P. L. and Toussant, M. J.: Induced Paragonimiasis in cats: Clinical signs and diagnosis. J. Am. Vet. Med. Assoc. 173(6): 734-742, 1978.

AFIP Diagnosis. Glossitis, ulcerative, acute, focal, moderate to severe, with epithelial ballooning degeneration and eosinophilic intracytoplasmic inclusion bodies, tongue, Landrace/Yorkshire, porcine, etiology--compatible with poxvirus.

Conference Note. The differential diagnosis includes foot and mouth disease, vesicular stomatitis, vesicular exanthema, vegetative dermatitis, skin lesions associated with erysipelas and hog cholera, and others. However, the histological finding of hydropic degeneration of cells in the stratum spinosum, and the presence of intracytoplasmic inclusion bodies are characteristic of poxvirus infections. Furthermore, vacuolation of the infected epithelial cell nuclei is said to be pathognomonic for swine pox, differentiating it from vaccinia virus (Kasza, 1981). Infection with swine pox is thought to interfere with development of titers to hog cholera vaccines.

The papillary structures on the tongue surface were thought by attendees to be marginal papillae which are present on the tongues of suckling animals and function to form a seal between tongue and nipple.

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Suggested reading.

Kasza, L. et al.: Experimental swine pox. Am. J. Vet. Res. 23: 443-451, 1962.

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Meyer, R. C. and Conroy, J. D.: Experimental swine pox in gnotobiotic piglets. Res. Vet. Sci. 13: 334-338, 1972.

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