Syllabus

Veterinary Pathology Department Wednesday Slide Conference 1987-1988

Armed Forces Institute of Pathology
Washington, D. C. 20306-6000
1992

M 90002

VETERINARY PATHOLOGY DEPARTMENT, AFIP,

WEDNESDAY SLIDE CONFERENCE

1987-1988

128 microslides

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PREFACE

The Department of Veterinary Pathology, Armed Forces Institute of Pathology, has conducted the Annual Wednesday Slide Conference Program for more than two decades. The cases presented each Wednesday throughout the academic year are also distributed to over 120 active participants, including military and civilian veterinary pathologists throughout the United States and Canada, as well as several foreign countries. The list of active contributors continues to grow. The diagnosis, comments, and a synopsis of the discussion for each case is forwarded to participants weekly.

This study set has been assembled in an effort to make the material presented at our weekly conferences available to a wider range of interested pathologists and other scientists. Discussion and comments are abbreviated in this syllabus for succinctness.

The study set includes 128 microslides from the 120 cases studied during the 1987-1988 conferences.

We wish to thank each contributor for his or her participation and for the permission to use cases in this study set.

LIST OF SLIDES

Slide number	Animal	Tissue	Diagnosis
1	Dog	Lung, Liver, Kidney	Canine herpesvirus
2	Cow	Kidney	Chediak-Higashi Syndrome
3	Dog	Pleura	Actinomyces sp
4	Horse	Colon	Colitis/small strongyles
5	Dog	Spinal cord	Globoid cell leukodystrophy
6	Horse	Medulla oblongata	Equine degenerative myelo-encephalopathy
7	Cow	Spinal cord	Myelodysplasia
8	Horse	Brain, Kidney	Locoweed (Astragalus) toxicosis
9	Goat	Lung	Caprine arthritis-encephalitis
10	Sheep	Paranasal sinus	Adenocarcinoma
11	Turkey	Spleen	Histomoniasis
12	Horse	Lung, Liver	CID/equine adenovirus/bacterial bronchopneumonia
13	Prairie dog	Lung, Lymph node	Yersinia pestis (plague)
14	Owl monkey	Kidney	Glomerulopathy and interstitial nephritis
15	Cow	Liver	Cocklebur (Xanthium) toxicosis
16	Dog	Pancreas	Islet cell carcinoma
17	Dog	Skeletal muscle	Blastomyces dermatitidis
18&19	Dog	Pancreas	Zygomycosis (Phycomycosis)
20	Sea lion	Lymph node	Coccidioides immitis
21	Pearl danios	Multiple organs	Pleistophora sp
22	Rabbit	Skin	Treponema cuniculi
23	Dog	Persistent Mullerian duct	Persistent Mullerian duct

LIST OF SLIDES (Cont'd)

Slide number	Animal	Tissue	Diagnosis
24	Rat	Adrenal gland	Ganglioneuroma/pheochromocytoma
25	Rat	Cerebrum	Zygomycosis (Phycomycosis)
26	Dog	Eye	Retinal detachment and arteriolo-sclerosis
27	Chicken	Lung	Cryptosporidium baileyi
28	Dog	Liver	Histiocytic sarcoma
29	Cat	Lymph node, Small intestine	Mycobacterium avium
30	Rat	Lung	Streptobacillus moniliformis
31	Mouse	Ovary	Yolk sac carcinoma
32	Mouse	Salivary gland	Myoepithelioma
33	Mouse	Liver	Salmonella enteritidis
34	Calf	Lung	Tritrichomonas foetus
35	Cow	Tongue	Bovine papular stomatitis
36	Cow	Abomasum	Clostridial abomasitis
37	Cow	Heart	Mesothelioma
38	Elk	Cerebellum	Ryegrass staggers
39	Turkey	Trachea	Bordetella avium
40	Cow	Lung	Hartmannella sp (Acanthamoeba sp)
41	Cow	Colon	Escherichia coli
42	Mouse	Lung	Cilia-associated respiratory bacillus
43	Sheep	Liver	Campylobacter fetus
44	Cow	Lung, Liver,	High-altitude disease
45&46	Dog	Skin, Subcutis	Lymphangiosarcoma

LIST OF SLIDES (Cont'd)

Slide number	Animal	Tissue	Diagnosis
47&48	Pig	Cerebrum, Lung, Liver	Pseudorabies
49	Rat	Cerebellum	Granular cell tumor
50	Rat	Lung	Corynebacterium kutscheri
51	Rat	Subcutis	Malignant fibrous histiocytoma
52	Horse	Liver	Lobar atrophy
53&54	Horse	Placenta	Encephalitozoon cuniculi
55	Horse	Nasal cavity	Ethmoid hematoma
56	Horse	Colon	Ehrlichia risticii
57	Goose	Large intestine	Echinostoma sp
58	Dog	Liver	Cirrhosis due to copper accumulation
59	Dog	Kidney, Lung	Renal amyloidosis and pulmonary thrombosis
60	Monkey	Retrobulbar mass	Lymphosarcoma
61	Turkey	Heart	Chlamydia psittaci
62	Frog	Liver, Skin	Chromoblastomycosis
63	Pigeon	Spleen, Liver	Toxoplasma gondii
64	Monkey	Colon	Chronic colitis
65	Monkey	Liver	Hepatocystis sp
66&67	Dog	Large intestine	Histiocytic ulcerative colitis
68	Cat	Liver, Spleen	Lymphosarcoma and mast cell tumor
69	Cow	Liver, Kidney	Lantana camara toxicosis
70	Cat	Brain	Thiamine deficiency/polio-encephalomalacia
71	Dog	Lung	Eosinophilic pulmonary granulomatosis

LIST OF SLIDES (Cont'd)

Slide number	Animal	Tissue	Diagnosis
72	Rabbit	Uterus, Lung	Adenocarcinoma, uterine
73	Dog	Bone marrow, Liver, Lung, Ganglion	Myelomonocytic neoplasia
74	Dog	Spinal cord	Alpha-L-fucosidase deficiency
75	Ferret	Colon	Campylobacter colitis
76	Horse	Kidney	Micronema deletrix
77	Dog	Ovary	Poorly differentiated carcinoma
78	Monkey	Intra-abdominal mass	Endometriosis
79	Mouse	Spleen	Follicular center cell lymphoma
80	Human	Brain	AIDS encephalopathy
81	Monkey	Brain	SIV encephalitis
82	Monkey	Lung, Pleura	Pulmonary fibromatosis
83&84	Cow	Rumen, Omasum	Mycotic rumenitis and omasitis
85	Chicken	Trachea	Fowlpox
86	Pig	Placenta	Leptospirosis
87	Horse	Testicle	Mixed germ cell-sex cord-stromal tumor
88	Horse	Heart	White snakeroot (Eupatorium rugosum) toxicosis
89	Pig	Skin	Erysipelas
90	Goose	Ventriculus	Strongylid nematodes
91	Cow	Brain stem	Sporadic bovine encephalomyelitis (Chlamydia pscittaci)
92	Dog	Brain stem	Pseudorabies
93	Rat	Testicle	Mesothelioma, interstitial cell tumors
94	Rabbit	Liver, Spleen	Yersinia pseudotuberculosis

LIST OF SLIDES (Cont'd)

Slide number	Animal	Tissue	Diagnosis
95	Monkey	Liver, Bile duct	Cholelithiasis, biliary hyperplasia, hepatitis
96	Frog	Skin	Capillaria xenopodis
97	Fish	Multiple organs	Mycobacterium sp
98	Fish	Liver	Hepatocellular copper accumulation, cholangioma
99	Rat	Lung	Metastatic chordoma
100	Sheep	Lung	Sheeppox
101	Dog	Uterus	Subinvolution of placental sites
102	Dog	Perianal mass	Adenocarcinoma of apocrine glands of anal sac
103	Cow	Brain stem	Haemophilus somnus
104	Pig	Tarsal joint	Actinobacillus suis arthritis
105	Cat	Bone	Fibrous osteodystrophy (renal)
106	Cat	Long bone	Osteomyelofibrosis with osteosclerosis and osteochondrodysplasia
107	Horse	Long bone	Klebsiella osteomyelitis
108	Mouse	Liver	Mouse hepatitis virus
109	Mouse	Liver, Small intestine, Large intestine	Schistosomiasis, adenovirus, Spironucleus sp, oxyurid nematodes, coccidia
110	Rat	Heart	Endocardial schwannoma
111	Dog	Skin	Caryospora bigenetica
112	Cat	Skin, Subcutis	Phaeohyphomycosis
113	Horse	Skin, Pancreas	Eosinophilic dermatitis and pancreatitis
114	Dog	Skin	Pemphigus foliaceous
115	Dog	Subcutis	Telangiectatic osteosarcoma
116	Cow	Mammary gland	Actinomyces pyogenes

LIST OF SLIDES (Cont'd)

Slide number	Animal	Tissue	Diagnosis
117	Cow	Cerebellum	Medulloblastoma
118	Cow	Esophagus	Infectious bovine rhinotracheitis
119&120	Pig	Heart	Encephalomyocarditis virus
121	Cow	Ganglion	Rabies
122	Bird	Liver	Adenovirus hepatitis
123	Cat	Skin, Subcutis	Sporothrix schenkii
124	Cow	Mandibular mass	Odontoma
125	Horse	Skeletal muscle	Salinomycin toxicosis
126	Dog	Thyroid gland	Lymphocytic thyroiditis
127	Pig	Small intestine	Adenovirus, Isospora suis
128	Dog	Urinary bladder	Botryoid rhabdomyosarcoma

COMMENTARY ON SLIDES

Slide 1

History. This approximately 2-week-old male mixed-breed canine exhibited severe respiratory distress when presented to a veterinary emergency clinic. Although a complete blood count was normal, the animal expired before treatment could be effected.

Gross Pathology. There were numerous petechial hemorrhages on the pleural surfaces of the lungs. The liver was swollen, pale, and mottled. Petechial and ecchymotic hemorrhages were present throughout the kidneys.

Diagnoses. 1. Lung: Pneumonitis, fibrinonecrotic, acute, multifocal, moderate, with associated eosinophilic intranuclear inclusion bodies, mixed-breed, canine. 2. Lung: Pneumonia, interstitial, subacute, diffuse, mild. 3. Liver: Necrosis, coagulative, multifocal, random, moderate, with associated eosinophilic intranuclear inclusion bodies. 4. Kidney: Coagulative necrosis and hemorrhage, segmental, multifocal, moderate to severe, with associated eosinophilic intranuclear inclusion bodies.

Contributor's Comment and Conference Note. A diagnosis of canine herpesvirus infection was made based on lesion morphology and on the presence of a few (mostly acidophilic) intranuclear inclusions, mainly in the kidney.

Canine herpesvirus causes severe, often fatal illness in puppies infected in the first 2 weeks of life; pups of this age are susceptible because their thermoregulatory and immune mechanisms are not yet fully competent. Pups infected after 2 weeks of age do not become severely ill. Adults may have inapparent or latent infections, upper respiratory infections, mild genital lesions, and abortions or stillbirths.

Contributor. University of Arizona, Tucson, AZ.

Suggested reading.

Greene, C. E.: Clinical Microbiology and Infectious Diseases of the Dog and Cat. Philadelphia, W. B. Saunders Co., 1984, pp. 419-429.

Hashimoto, A., Hirai, K., Okada, K., and Fujimoto, Y: Pathology of the placenta and newborn pups with suspected intrauterine infection of canine herpesvirus. Am. J. Vet. Res. 40(9): 1236-1240, 1979.

Slide 2

History. This 4-month-old male brangus bovine was euthanized because of necrotic glossitis and abscessation of the left mandibular area.

Gross Pathology. An 8- to 9-cm subcutaneous mass was present over the left mandible. A large ulcer was present on the base of the tongue.

Diagnosis. Kidney, cytoplasm of tubular epithelial cells: PAS-positive bodies, diffuse, brangus, bovine.

Contributor's Comment and Conference Note. The presence of periodic acid-Schiff-positive glycolipid granules in the cytoplasm of the tubular segments of the nephron is consistent with a diagnosis of Chediak-Higashi syndrome. This is the first recorded case of Chediak-Higashi syndrome in brangus cattle. The disease has been observed in other calves from this same ranch, however. Affected calves are hypopigmented and photophobic, and two have died from abscessation. Their hair has a clumping and paucity of melanin granules, and their granulocytes have large lysosomal aggregates.

Chediak-Higashi syndrome is a rare, autosomal recessive disorder of man. Similar syndromes have been reported in Aleutian mink, Hereford cattle, beige mice, Persian cats, foxes, and a killer whale. Characteristic features of the disorder include oculocutaneous pigmentary defects; the presence of large granules in leukocytes (neutrophils, monocytes, and eosinophils) and many other cell types; increased susceptibility to infection due to defective leukocyte chemotaxis and phagosome/lysosome fusion; and bleeding tendencies in some species due to defective platelet function. The PAS-positive granules in renal tubular epithelial cells apparently represent a functional defect that results in faulty excretion or digestion of glycolipid material, so that it accumulates within lysosomes. The granules are present in all tubular segments of the nephron.

Contributor. College of Veterinary Medicine, Kansas State University, Manhattan, KS.

Suggested reading.

Ayers, J. R., Leipold, H. W., and Padgett, G. A.: Lesions in brangus cattle with Chediak-Higashi syndrome. Vet. Pathol. 25: 432-436, 1988.

Padgett, G. A., Reiquam, C. W., Gorham, J. R., Henson, J. B., and O'Mary, C. C.: Comparative studies of the Chediak-Higashi syndrome. Am. J. Pathol. 51(4): 553-569, 1967.

Slide 3

History. This is tissue from a 24-month-old male beagle dog that was found dead.

Gross Pathology. The thoracic cavity contained 400 ml of dark-red, turbid fluid with numerous yellowish-white granules. The lungs were dark-red to black, and the pleural and mediastinal tissues were thick and roughened.

Diagnosis. Pleura (per contributor): Pleuritis, pyogranulomatous, chronic, proliferative, diffuse, with discrete colonies of branching, filamentous bacteria, beagle, canine.

Contributor's Comment and Conference Note. The characteristic features of etiologic agents that can cause chronic pleuritis in the canine were considered. Actinomyces sp are branching and filamentous, gram-positive, and nonacid-fast. Nocardia sp, are also branching and filamentous but are moderately to weakly gram-positive and weakly acid-fast. Actinobacillus sp are gram-negative rods. The Staphylococcus spp of botryomycosis are gram-positive cocci. Bacteroides spp are gram-negative and filamentous.

Contributor. Sterling-Winthrop Research Institute, Rensselaer, NY.

Suggested reading.

Robertson, S. A., Stoddart, M. E., Evans, R. J., Gaskell, C. J., and Gibbs, C.: Thoracic empyema in the dog; a report of twenty-two cases. J. Small Anim. Pract. 24: 103-119, 1983.

Swerczek, T. W., Schiefer, B., and Nielsen, S. W.: Canine actinomycosis. Zbl. Vet. Med. 15: 955-970, 1968.

Slide 4

History. This 1-1/2-year-old male appaloosa horse had a history of poor growth and weight gain. Fecal sample was negative for Salmonella.

Gross Pathology. The animal was emaciated (he had no body fat), and there was serous atrophy of fat and ascites. The mucosa of the large colon was covered with petechiae and had focal erosions and ulcerations.

Diagnosis. Colon: Colitis, pyogranulomatous, chronic, diffuse, moderate, with associated nematode larvae in mucosa and submucosa, appaloosa, equine.

Contributor's Comment and Conference Note. Clinical disease caused by infection with small strongyles is uncommon but can occur when arrested third-stage larvae emerge in large numbers from the walls of the cecum and colon into the lumen (hypobiosis) in late fall, winter, or early spring. Chronic weight loss, unthriftiness, and diarrhea may result.

Equids reportedly can be infected by as many as 17 genera and 48 species of small strongyles; however, there is scant information about many of these species. Conference participants noted that the larval cross sections varied in size, and the possibility of a mixed infection by large and small strongyles was discussed.

Contributor. Virginia-Maryland Regional College of Veterinary Medicine, Virginia Tech, Blacksburg, VA.

Suggested reading.

Barker, I. K., and Van Dreumel, A. A.: The alimentary system. In: Pathology of Domestic Animals, Jubb, K. V. F., Kennedy, P. C., Palmer, N. (eds.) Vol 2, 3rd. Ed., Academic Press, Inc., pp. 178-179, 1985.

Jasko, D. J., and Roth, L.: Granulomatous colitis associated with small strongyle larvae in a horse. J. Am. Vet. Med. Assoc. 185(5): 553-554, 1984.

Slide 5

History. This 6-month-old male West Highland white terrier was apparently healthy when purchased at 10 weeks of age from a pet shop. At 24 weeks of age his owners reported hind limb ataxia and mild head tremors that worsened with exercise. On examination, neurological deficits were noted, especially in the rear limbs. Survey radiographs, myelogram, and CSF analysis were unremarkable. The puppy was euthanatized and necropsied at 25 weeks of age.

Gross Pathology. There were no gross lesions.

Diagnosis. Spinal cord, peripheral white matter: Histiocytosis, perivascular, multifocal, mild to moderate, with multifocal histiocytic radicular infiltration, West Highland white terrier, canine.

Contributor's Comment and Conference Note. Microscopically, there is severe, diffuse demyelination of white matter with regionally extensive perivascular aggregates of histiocytes, some with prominent globoid eosinophilic cytoplasm. The smaller diameter, thoracic segment is more severely affected in all funiculi, while the lesions in the lumbar segment mainly involve the dorsal funiculus.

The underlying defect in globoid-cell leukodystrophy (GLD) is deficient activity of galactocerebroside β-galactosidase, the enzyme that

cleaves the beta-glycosidic linkage from galactocerebroside and other compounds with beta-glycosidic linkages, including galactosylsphingosine (psychosine). These compounds are not degraded and accumulate within oligodendroglia, Schwann cells, and the characteristic histiocytic globoid cells. This results in degeneration and necrosis of oligodendroglia and Schwann cells, apparently because the accumulated material is toxic. The eventual result is hypomyelination or dysmyelination, loss of oligodendroglia, astrocytosis, and an accumulation of the phagocytic globoid cells. GLD is an autosomal recessive trait in cairn and West Highland white terriers, occurs rarely in other breeds of dogs and cats, and has been reported in polled Dorset sheep and twitcher mice.

Contributor. Angell Memorial Animal Hospital, Boston, MA.

Suggested reading.

Fletcher, T. F., and Kurtz, H. J.: Animal model for human disease: Globoid cell leukodystrophy, Krabbe's disease. Am. J. Pathol. 66: 375-378, 1972.

Fletcher, T. F., Kurtz, H. J., and Low, D. G.: Globoid cell leukodystrophy (Krabbe type) in the dog. J. Am. Vet. Med. Assoc. 149: 165-172, 1966.

Slide 6

History. This 9-month-old male appaloosa equine had an abrupt onset of "wobbling" at 5 months of age. He was from a family of appaloosas in which seven other males also exhibited generally progressive spinal ataxia. No abnormalities were noted with CSF analysis or cervical radiography. Serum alpha-tocopherol from this horse was 0.4 ug/ml; four other affected horses had serum alpha-tocopherol values of 0.7, 1.9, 1.5, and 1.5 ug/ml (normal, 2.0 - 7.0 ug/ml).

Gross Pathology. None present.

Diagnosis. Medulla oblongata, nuclei, bilateral: Swollen axons (spheroids), multifocal, moderate, appaloosa, equine.

Contributor's Comment and Conference Note. Neuroaxonal dystrophy with loss of neurons and axons is present in the proprioceptive nuclei of the caudal medulla and is most prominent in the cuneate nuclei; similar changes were also noted in the gray matter of the spinal cord, primarily in the nucleus thoracicus (Clark's column). Wallerian degeneration is noted in the funiculi of the spinal cord and caudal brainstem and is most prominent in the dorsal spinocerebellar and ventral tracts of the thoracic cord. Neuronal lipofuscin pigment accumulation is

present in the spinal cord gray matter and in the affected brain stem nuclei.

These morphologic changes are consistent with equine degenerative myeloencephalopathy (EDM) and neuronal lipofuscinosis. Clusters of EDM or EDM-like diseases have been reported in zebras, Mongolian wild horses, thoroughbreds, and standardbreds, in addition to this family of appaloosas.

Alpha-tocopherol deficiency has previously been associated with EDM. The presence of lipofuscin pigment is indirect evidence for increased lipid peroxidation and supports a role for a deficiency of alpha-tocopherol and/or other antioxidants in the pathogenesis of EDM. In addition, supplements of vitamin E on farms with histories of EDM can reduce or eliminate the deficiency.

According to the moderator, since there is a mixture of dystrophic and degenerating axons present in this section, either equine degenerative myeloencephalopathy (EDM) or neuroaxonal dystrophy is a suitable diagnosis based on the presence of swollen axons in the medullary nuclei. This is because spheroids are not unique to either dystrophic or degenerative conditions and can, in fact, result from several different mechanisms.

Contributor. College of Veterinary Medicine, Oregon State University, Corvallis, OR.

Suggested reading.

Beech, J.: Neuroaxonal dystrophy of the accessory cuneate nucleus in horses. Vet. Pathol. 21: 384-393, 1984.

Mayhew, I. G., Brown, C. M., Stowe, H. D., Trapp, L., Derksen, F. J., and Clement, S. F.: Equine degenerative myeloencephalopathy: A vitamin E deficiency that may be familial. J. Vet. Int. Med. 1: 45-49, 1987.

Mayhew, I. G., DeLahunta, A., Whitlock, R. H., and Geary, J. C.: Equine degenerative myeloencephalopathy. J. Am. Vet. Med. Assoc. 170: 195-201, 1977.

Slide 7

History. This is tissue from a 1-day-old female Holstein calf that was unable to rise. It had a short tail and a reduction in the size of the muscle of its hindquarters. A fluid-filled sac (2x5 cm) extended through the skin to the left of the sacrum. Serum samples were negative for bovine virus diarrhea and infectious bovine rhinotracheitis.

Gross Pathology. The sac was a meningomyelocele extending from the meningeal space at the end of the spinal cord through a sacral

opening. The spinal cord had a crevice or dorsal opening along the lumbar and sacral segments.

Diagnosis. Spinal cord, dorsal funiculus: Dysplasia, cystic, multifocal, moderate, Holstein, bovine.

Contributor's Comment and Conference Note. Histologically, this section of lumbar spinal cord shows total or partial absence of the ascending white tracts and separation of right and left halves along the dorsal midline. There is absence of neurons in the dorsal horns of the gray matter, and several dilated spaces lined by flattened cells are present.

The lesions of the spinal cord and additional gross findings of asymmetry of the cerebral hemispheres, microgyri of the cortex, hydrocephalus and meningomyelocoele are consistent with the Arnold-Chiari malformation. This malformation was first described in man, and only a few cases have been reported in cattle.

Contributor. College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO.

Suggested reading.

Braund, K. G.: Clinical Syndromes in Veterinary Neurology, Williams & Wilkins Co., pp. 164-165, 1986.

Cho, D. Y., and Leipold, H. W.: Arnold-Chiari malformation and associated anomalies in calves. Acta. Neuropath. (Berl.) 39: 129-133, 1977.

Slide 8

History. In early February, seven horses out of a herd of 20 were observed to be losing weight. They had been on native grass pasture for several months. The horses initially refused to eat or drink and had an aggressive behavior; several died. This tissue is from a 2-year-old crossbred female equine.

Gross Pathology. No gross lesions.

Diagnoses. 1. Brain, neuronal cytoplasm: Vacuolation, diffuse, severe, crossbreed, equine. 2. Kidney, epithelium of proximal convoluted tubules: Vacuolation, cytoplasmic, segmental, multifocal, moderate.

Contributor's Comment and Conference Note. The vacuolar change in neurons and renal tubular epithelial cells is consistent with locoweed (Astragalus sp) toxicosis. Abundant locoweed was present where these horses were pastured; the selenium level in the liver was

within normal limits. Locoweeds are common leguminous plants of the rangelands of western North America and are classified within the genera Astragalus and Oxytropis. The hundreds of species have diverse effects when consumed by domestic animals. The plants of the toxic group that cause locoism contain the toxic constituent swainsonine. Swainsonine inhibits the lysosomal enzyme alpha-mannosidase, mimicking the inherited disorder mannosidosis of humans, Angus cattle, and Persian cats.

Contributor. New Mexico Veterinary Diagnostic Services, Albuquerque, NM.

Suggested reading.

Alroy, J., Orgad, U., Ucci, A. A., and Gavris, V. E.: Swainsonine toxicosis mimics lectin histochemistry of mannosidosis. Vet. Pathol. 22: 311-316, 1985.

James, L. F., Hartley, W. J., and Van Kampen, K. R.: Syndromes of Astragalus poisoning in livestock. JAVMA 178(2): 146-150, 1981.

Slide 9

History. This 2-year-old female LaMancha caprine had been losing weight for the past 4 months despite good appetite. There were obvious respiratory signs for several weeks prior to being presented for veterinary evaluation.

Gross Pathology. Large portions of the lung lobes were reddish tan and firm on palpation. On cut surface, pulmonary consolidation was evident; no purulent material was seen. The brain, meninges, and examined joints were grossly normal.

Diagnosis. Lung: Pneumonia, interstitial, chronic, diffuse, severe, with multifocal peribronchiolar and perivascular lymphoid hyperplasia and diffuse intra-alveolar proteinosis, LaMancha, caprine.

Contributor's Comment and Conference Note. This goat was serologically positive for caprine arthritis-encephalitis virus (CAEV). This virus is antigenically related to, but distinct from, the lentivirus that causes ovine progressive pneumonia (maedi-visna). Both viruses cause lesions primarily in the brain, joints, lung, and mammary gland. These viruses apparently enter the milk from the infiltrating lymphoid cells that are adjacent to ducts and are then transmitted to neonates in the colostrum or milk.

The histologic lesions present in the lungs of this goat are typical and are characterized by interstitial pneumonia, nodular lymphoid hyperplasia, and accumulation of a homogeneous eosinophilic,

PAS-positive material within alveoli and bronchioles that contains scattered inflammatory cells.

Contributor. New York State College of Veterinary Medicine, Cornell University, Ithaca, NY.

Suggested reading.

Ellis, J., and DeMartini, J. C.: Retroviral diseases in small ruminants: Ovine progressive pneumonia and caprine arthritis-encephalitis. Comp. Cont. Ed. 5: S173-183, 1983.

Robinson, W. F., and Ellis, T. M.: The pathological features of an interstitial pneumonia of goats. J. Comp. Path. 94: 55-64, 1984.

Slide 10

History. This adult female Booroola ovine was found down with CNS signs.

Gross Pathology. The paranasal sinuses and ethmoid region of the nasal cavity contained a mass that extended through the cribriform plate and invaded the cranial cavity and the anterior portion of the cerebrum.

Diagnosis. Paranasal sinus (per contributor): Adenocarcinoma, papillary, Booroola, ovine.

Contributor's Comment and Conference Note. Intranasal adenocarcinomas in sheep are thought to arise from branched tubuloalveolar serous (Bowman's) glands in the olfactory mucosa of the nasal cavity. Local invasion of the paranasal sinuses and cranial cavity are often observed, and metastasis is rare.

Enzootics of intranasal papillary adenomas and adenocarcinomas have been reported in sheep, and viral particles morphologically similar to visna-maedi virus have been detected in tumor cells and in culture. However, most attempts at reproduction of the condition have been unsuccessful.

Contributor. University of Nebraska-Lincoln, Lincoln, NE.

Suggested reading.

McKinnon, A. O., Thorsen, J., Hayes, M. A., and Misener, C. R.: Enzootic nasal adenocarcinoma of sheep in Canada. Can. Vet. J. 23: 88-94, 1982.

Yonemichi, H., Ohgi, T., Fujimoto, Y., Okada, K., Onuma, M., and Mikami, T.: Intranasal tumor of the ethmoid olfactory mucosa in sheep. Am. J. Vet. Res. 39: 1599-1606, 1978.

Slide 11

History. A group of turkeys developed symptoms of pale combs and wattles with a nasal discharge about 48 hours prior to death. A 4-month-old male domestic turkey was necropsied.

Gross Pathology. There was moderate hepatosplenomegaly, disseminated to diffuse necrosis of the spleen, multifocal necrotizing hepatitis, and disseminated necrotizing typhlitis.

Diagnosis. Spleen: Splenitis, necrotizing, subacute, diffuse, severe, with protozoal organisms, turkey, avian.

Contributor's Comment and Conference Note. The liver and ceca contained the typical lesions of histomoniasis or blackhead disease; however, this splenic lesion is seldom reported. The spleen was diffusely involved and had an unusual moth-eaten or starry-sky pattern that was attributed to the histomonads. The histomonad organisms presumably infected the spleen during the protozoemic phase of the disease.

Contributor. Maryland Department of Agriculture, College Park, MD.

Suggested reading. McDougald, L. R.: Other protozoan diseases of the intestinal tract. In: Diseases of Poultry, Hofstad, M. S., Barnes, H. J., Calnek, B. W., Reid, W. M., Yoder, H. W. (eds.). 8th Ed., Iowa State University Press, pp. 717-723, 1984.

Slide 12

History. This 6-week-old male Arabian foal at about 3 weeks of age developed respiratory disease that initially responded to antibiotics but recurred and became chronic. The foal was finally euthanized at 6 weeks of age.

Gross Pathology and Laboratory Results. Coalescing abscesses were present throughout the lungs, involving approximately 75% of the parenchyma; Nocardia asteroides, Bacillus sp, and Streptococcus sp (group D) were isolated from these lesions. The liver was firm and had a distinct lobular pattern, and scattered 1- to 2-mm diameter white foci

were present in both the liver and kidneys. Streptococcus sp (group D) was isolated from the liver.

Diagnoses. 1. Lung: Bronchopneumonia, suppurative, chronic, focally extensive, severe, with multiple, coalescing abscesses, Arabian, equine. 2. Lung, bronchioles: Bronchiolitis, necrotizing, acute, multifocal, moderate, with basophilic intranuclear inclusion bodies. 3. Liver: Cholangiohepatitis, chronic, multifocal, moderate, with biliary hyperplasia and basophilic intranuclear inclusion bodies. 4. Liver: Abscess, solitary.

Contributor's Comment and Conference Note. The multifocal suppurative pneumonia was considered typical of that caused by Rhodococcus (Corynebacterium) equi; however, this organism was not isolated from the lung. Previous antibiotic therapy may have prevented its isolation, or secondary invaders may have become predominant as the pneumonia became more chronic. The large basophilic intranuclear inclusion bodies in bronchiolar epithelial cells, bile duct epithelial cells, and hepatocytes are typical of adenovirus infection. Adenovirus was subsequently isolated from the lung and liver of this foal.

The moderator stressed that the extensive inflammation in the lung is notable because there is a lack of lymphocytes, plasma cells, and multinucleated giant cells in what otherwise appears to be chronic disease. This feature, along with the adenoviral inclusions in the lung and liver, is strongly suggestive of immunodeficiency. Antemortem blood samples and lymphoid organs were not available for examination, however, and a definitive diagnosis of CID could not be made. Combined immunodeficiency syndrome occurs in 2% to 3% of Arabian foals; it is the most important congenital equine immunodeficiency and is inherited as an autosomal recessive trait.

Contributor. New Mexico Department of Agriculture, Albuquerque, NM.

Suggested reading.

Dungworth, D. L.: The respiratory system. In: Pathology of Domestic Animals, Jubb, K. V. F., Kennedy, P. C., Palmer, N. (eds.). 3rd Ed, Vol 2, Academic Press, Inc. , p. 483, 1985.

McGuire, T. C., Banks, K. L., and Davis, W. C.: Alterations of the thymus and other lymphoid tissue in young horses with combined immunodeficiency. Am. J. Pathol. 84: 39-49, 1976.

Slide 13

History. The tissues submitted are from an adult female white-tailed prairie dog (Cynomys leucurus) that was experimentally

infected with an isolate of Yersinia pestis obtained from free-ranging prairie dogs.

Gross Pathology. Hemorrhage and edema were present in the subcutis surrounding enlarged, hemorrhagic, right prefemoral lymph nodes as well as the right external and internal iliac lymph nodes. The lungs were edematous, did not collapse, and contained multiple, varisized hemorrhagic foci.

Diagnoses. 1. Lung: Pneumonia, interstitial, acute to subacute, diffuse, mild, with intravascular bacteria, white-tailed prairie dog (Cynomys leucurus), rodent. 2. Lymph node: Lymphadenitis, necrosuppurative, diffuse, severe, with associated perinodal lymphangitis, inflammation of perinodal adipose tissue, and numerous bacterial colonies.

Contributor's Comment and Conference Note. Yersinia pestis is a polymorphous gram-negative bacillus that is capable of apparently unrestricted proliferation in the tissues of susceptible species. This case is typical of plague in highly susceptible species and demonstrates massive bacteremia, endotoxemia, and disseminated intravascular coagulation. Sylvatic plague occurs in wild rodents in many western states but seldom causes disease in humans or domestic animals. Prairie dogs are highly susceptible, and epizootics may cause 100% mortality under some conditions. In affected animals, there is extensive local replication of bacteria and spread to the regional lymph nodes and blood stream. Bacteremia and endotoxemia may follow and result in disseminated intravascular coagulation and death.

Contributor. Wyoming State Veterinary Laboratory, University of Wyoming, Laramie, WY.

Suggested reading.

Rosser, W. W.: Zoonosis update: bubonic plague. J. Am. Vet. Med. Assoc. 191: 406-409, 1987.

Williams, J. E., Moussa, M. A., and Cavanaugh, D. C.: Experimental plague in the California ground squirrel. J. Infect. Dis. 140: 618-621, 1979.

Slide 14

History. This adult female owl monkey (Aotus trivirgatus) was found dead with no signs of previous illness noted.

Gross Pathology. Bilaterally, the kidneys were irregular with a slightly pitted, granular surface. Multiple irregular, grayish-white streaks were present in the cortex extending to the capsular surface.

Diagnoses. 1. Kidney: Nephritis, interstitial, chronic-active, eosinophilic, multifocal, moderate, with associated tubular degeneration, owl monkey (Aotus trivirgatus), primate. 2. Kidney: Glomerulopathy, multifocal, moderate, characterized by sclerosis, synechia formation, parietal epithelial proliferation and crescent formation, and periglomerular fibrosis. 3. Kidney, medulla: Fibrosis, interstitial, diffuse, moderate.

Contributor's Comment and Conference Note. Conference discussion centered on the appropriateness of the diagnosis of membranoproliferative glomerulonephritis to characterize the lesions in this case. The moderator suggested that a definitive diagnosis of glomerulonephritis requires examination of thin sections and special stains; immunofluorescence and electron microscopy are also important. The descriptive diagnosis of glomerulopathy was thus chosen to characterize the lesions.

Nonetheless, glomerulonephritis is one of the most common disease entities of captive owl monkeys. Immune complex deposition within the subepithelial, intramembranous, and mesangial regions of glomeruli has been documented ultrastructurally. These complexes are presumably associated with infections that occur in the natural habitat or that are experimentally induced. Hemolytic anemia and interstitial nephritis are also commonly observed in captive owl monkeys; however, the relationship between these entities and glomerulonephritis is undetermined.

Contributor. NIH, Comparative Pathology Section, Bethesda, MD.

Suggested reading.

Chalifoux, L. V., Bronson, R. T., Sehgal, P., Blake, B. J., and King, N. W.: Nephritis and hemolytic anemia in owl monkeys (Aotus trivirgatus). Vet. Pathol. 18 (Suppl 6): 23-37, 1981.

Hunt, R. D., Van Zwieten, M. J., Baggs, R. B., Sehgal, P. K., King, N. W., Roach, S. M., and Blake, B. J.: Glomerulonephritis in the owl monkey (Aotus trivirgatus). Lab. Anim. Sci. 26: 1088-1092, 1976.

King, N. W., Baggs, R. B., Hunt, R. D., VanZwieten, M. J., and Mackey, J. J.: Glomerulonephritis in the owl monkey (Aotus trivirgatus): ultrastructural observations. Lab. Anim. Sci. 26: 1093-1103, 1976.

Slide 15

History. This is tissue from a 4-month-old male bovine. The calf received a single dose of ground cocklebur dicotyledons by stomach tube

at the rate of 1% of body weight. The calf died about 70 hours after treatment. Prior to death, the animal was markedly hypoglycemic (28 mg/dl), and his serum gamma glutamyltransferase was 178 IU/l (8-9 times the normal).

Gross Pathology. The lobular pattern of the liver was accentuated by reddened zones.

Diagnosis. Liver: Necrosis, hemorrhagic, centrolobular, diffuse, severe, breed unspecified, bovine.

Contributor's Comment and Conference Note. The toxic principle of cockleburs (Xanthium spp) is carboxyatractyloside; this compound is present in the dicotyledonary or two-leaf seedling stage. Pigs and cattle find these seedlings to be palatable; and since large numbers of plants can emerge at a time when other forages are unavailable, intoxications can occur. Seeds of the cocklebur contain even higher concentrations of carboxyatractyloside but are usually not eaten, because of their spiny covering.

The hepatocytes in the centrolobular or periacinar zones of the liver are particularly sensitive to toxic insult because they are last in the lobule to receive oxygen and nutrients from portal and arterial blood and contain the greatest concentrations of mixed-function oxidases. These enzymes can transform exogenous compounds into reactive metabolites that may be cytotoxic.

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

Suggested reading.

Martin, T., Stair, E. L., and Dawson, L.: Cocklebur poisoning in cattle. J. Am. Vet. Med. Assoc. 189: 562-563, 1986.

Stuart, B. P., Cole, R. J., and Gosser, H. S.: Cocklebur (Xanthium strumarium, L. var. Strumarium) intoxication in swine: review and redefinition of the toxic principle. Vet. Pathol. 18: 368-383, 1981.

Slide 16

History. This 8.5-year-old male beagle dog became anorectic and developed bloody diarrhea. Serum gastrin concentration just prior to death was 284 pg/ml (levels in clinically normal male dogs in the same colony were 25 - 56 pg/ml).

Gross Pathology. At necropsy, the dog had an ulcerative gastroenteritis with multiple perforations of the proximal duodenum. Throughout the pyloric region of the stomach, duodenum, and proximal

jejunum were several varisized foci of mucosal ulceration. In addition, there was a localized reddening of the peritoneal surfaces surrounding the intestinal perforations. A 1x2x1-cm firm, white mass was located within the pancreas.

Diagnosis. Pancreas: Islet cell carcinoma, beagle, canine.

Contributor's Comment and Conference Note. Immunocytochemistry revealed that the majority of the neoplastic cells demonstrated gastrin immunoreactivity. Sections stained with antibodies against insulin, glucagon, somatostatin, and vasointestinal polypeptide were not immunoreactive.

The cause of this dog's death was intestinal perforation secondary to ulcerative enteritis. The assumed cause of the mucosal ulcerations was hypersecretion of duodenal gastric acid, induced by elevated serum gastrin levels. Non-beta cell tumors of the pancreas produce gastrin and are responsible for elevated serum levels seen in dogs and humans and producing the Zollinger-Ellison syndrome. The clinical signs, lesions, and immunocytochemistry in this case were characteristic.

Contributor. Lovelace Inhalation Toxicology Research Institute, Albuquerque, NM.

Suggested reading.

Breitschwerdt, E. B., Turk, J. R., Turnwald, G. H., Davenport, D. J., Hedlund, C. S., and Carakostas, M. C.: Hypergastrinemia in canine gastrointestinal disease. J. Am. An. Hosp. Assoc. 22: 585-592, 1986.

Happe, R. P., van der Gaag, I., Lamers, C. B. H. W., van Toorenburg, J., Rehfeld, J. F., and Larsson, L. I.: Zollinger-Ellison syndrome in three dogs. Vet. Pathol. 17: 177-186, 1980.

O'Brien, T. D., Hayden, D. W., O'Leary, T. P., Caywood, D. D., and Johnson, K. H.: Canine pancreatic endocrine tumors: immunohistochemical analysis of hormone content and amyloid. Vet. Pathol. 24: 308-314, 1987.

Slide 17

History. This is tissue from a 2-year-old male Great Dane with a history of renal failure, uveitis, and heartworms.

Gross Pathology. There were multiple 2- to 4-mm-diameter ulcers on the dorsum of the tongue. The right temporal muscle contained an irregular 1.5x0.5-cm dull-yellow focus. The parenchyma of the right testicle contained a nodule approximately 4 mm in diameter. The submandibular, cranial mediastinal, and bronchial lymph nodes were greatly enlarged and light yellow and contained numerous gritty foci.

The abdominal cavity contained approximately a liter of clear, amber fluid. Both kidneys were pale and stippled with small red foci; on section, the cortex had a slightly granular appearance. The right ventricle and atrium of the heart contained numerous heartworms; the major pulmonary arteries and their branches were nearly occluded by masses of worms.

Diagnosis. Skeletal muscle: Myositis, pyogranulomatous, multifocal to coalescing, moderate, with yeast organisms, Great Dane, canine.

Contributor's Comment and Conference Note. For the purpose of this seminar, specimens were submitted to the Centers for Disease Control, Atlanta, GA, for confirmation of Blastomyces dermatitidis as the etiologic agent. Blastomyces dermatitidis causes systemic or localized, chronic pyogranulomatous disease in numerous animal species; humans and dogs are most frequently affected. The disease predominantly affects young large-breed male dogs, with the lung being the organ most consistently involved; secondary involvement of other organs commonly occurs. Lesions in skeletal muscle are rarely reported in blastomycosis, perhaps because muscles are often not closely examined at necropsy. In all affected tissues, the organisms had thick cell walls, varied in size from 6 to 15 microns, and exhibited frequent broadbased budding.

Contributor. College of Veterinary Medicine, Mississippi State University, Mississippi State, MS.

Suggested reading.

Barsanti, J. A.: Blastomycosis. In: Clinical Microbiology and Infectious Diseases of the Dog and Cat, Greene, C. E. (ed). W.B. Saunders Co., pp. 675-686, 1984.

Legendre, A. M., Walker, M., Buyukmihci, N., and Stevens, R.: Canine blastomycosis: a review of 47 clinical cases. J. Am. Vet. Med. Assoc. 178: 1163-1168, 1981.

Slides 18 & 19

History. This approximately 1-1/2- to 2-year-old male mixed-breed dog had been vomiting several times daily for 1 month and losing weight. At the time of examination, he was moderately hyperproteinemic (9.9 g/dl), hypochloremic (85 mEq/l), and hypokalemic (2.8 mEq/l). A partial gastrectomy, duodenectomy, and pancreatectomy were performed for relief of pyloric constriction and obstruction.

Gross Pathology. Surgical specimens were gastric pylorus, proximal duodenum, and pancreas. The pyloric and duodenal walls were thickened, firm, and, on section, mottled yellow and gray.

Diagnosis. Pancreas: Pancreatitis, pyogranulomatous and eosinophilic, chronic, diffuse, severe, with peripancreatic steatitis, and intralesional hyphal elements, mixed-breed, canine.

Contributor's Comment and Conference Note. Fungal hyphae, best demonstrated in sections stained with Gomori's methenamine silver, are sparsely septated, irregularly branching, and vary in width (2-8u). Fungal morphology and host reaction are typical of phycomycosis. Definitive diagnosis requires culture, which was not attempted.

Several authors have reported that the presence or absence and the amount of Splendore-Hoeppli material may be useful in distinguishing between the different phycomycotic organisms. The fungi causing mucormycosis (Rhizopus, Mucor, Absidia, and Mortierella) typically do not elicit the Splendore-Hoeppli phenomenon. Those causing entomophthoromycosis (Conidiobolus and Basidiobolus spp) produce a wide zone of eosinophilic material; the zone surrounding Pythium sp is usually much narrower.

In a review of canine phycomycosis, involvement of the stomach and duodenum was the most common manifestation of disease. A proposed cause of infection is consumption of foreign bodies such as wooden sticks, which may transport the fungus and traumatize the gastric mucosa. Extension of the fungus from its primary site of infection is often by direct invasion, but hematogenous or lymphogenous dissemination has been reported.

Contributor. College of Veterinary Medicine, Texas A&M University, College Station, TX.

Suggested reading.

Ader, P. L.: Phycomycosis in fifteen dogs and two cats. J. Am. Vet. Med. Assoc. 174: 1216-1223, 1979.

Miller, R. I.: Gastrointestinal phycomycosis in 63 dogs. J. Am. Vet. Med. Assoc. 186: 473-478, 1985.

Slide 20

History. This free-ranging male California sea lion (Zalophus californianus) was rescued from the Monterey Coast region and was referred to the California Marine Mammal Center. Initial physical examination revealed that the animal had a mucoid nasal discharge and foamy black diarrhea. The sea lion died before the examination was completed.

Gross Pathology. The left thoracic cavity was filled with straw-colored fluid, the right with hemorrhagic fluid. Throughout the mediastinum were multiple fibrotic nodules, some of which contained cheesy, purulent exudate. The right lung could not be easily distinguished from the mediastinal nodules. Similar nodules were in the atelectic left lung and on the pericardial sac. The stomach contained roundworms and foamy hemorrhagic mucus; numerous ulcers were on the mucosal surface.

Diagnosis. Lymph node: Granulomas, multiple, coalescing, with fungal elements consistent with Coccidioides immitis, California sea lion (Zalophus californianus), pinnipedia.

Contributor's Comment and Conference Note. The diagnosis of Coccidioides immitis infection was based on the characteristic morphology of the organism in tissue sections (spherules with thick double-contoured walls, generally ranging in size from 30-45 microns, with occasional larger forms containing endospores).

Coccidioidomycosis is endemic in parts of the southwestern United States. Conditions that favor growth and dissemination of C. immitis include an arid or semi-arid climate, alkaline soil, sparse vegetation, and dusty winds. The infection is primarily one of the respiratory tract, is generally acute and self-limiting, and may be asymptomatic or present as acute bronchitis or pneumonia. A small number of cases become disseminated, and lesions may then be found anywhere in the body.

The moderator pointed out that, unlike some pinnipeds, the California sea lion spends much of its time on land and is therefore exposed to soil-borne infectious agents. Also, since it has a relatively short annual migratory pattern, this mammal frequents the coastlines of endemic areas.

Contributor. College of Veterinary Medicine, University of California, Davis, CA.

Suggested reading.

Dungworth, D. L.: The respiratory system. In: Pathology of Domestic Animals, Jubb, K. V. F., Kennedy, P. C., Palmer, N. (eds). 3rd Ed, Vol 2, Academic Press, Inc., pp. 518-520, 1985.

Reed, R. E., Migaki, G., and Cummings, J. A.: Coccidioidomycosis in a California sea lion (Zalophus californianus). J. Wildl. Dis. 12: 372-375, 1976.

Slide 21

History. Over a 10-month period, 20 fish, including various catfish and danios died; all were kept in the same 33-gallon tank. Five remaining pearl danios were gasping, swimming erratically, and not eating. Four had kinked tails. An adult male pearl danio (Brachydanio elbolineatus) with slowly enlarging masses was submitted for histopathology.

Gross Pathology. The fish was emaciated. The masses behind the operculum had the same appearance and consistency as muscle.

Diagnoses. 1. Multiple organs: Protozoal cysts and spores, disseminated, with associated mild subacute inflammation, pearl danio (Brachydanio elbolineatus), piscine. 2. Skeletal muscle: Myodegeneration, diffuse, moderate.

Contributor's Comment and Conference Note. Based on the number of spores per sporocyst (average of 27; 100 counted) and the presence of a single polar filament observed on transmission electron microscopy, this is a microsporidian protozoa of the genus Pleistophora. Pleistophora spp have been reported in freshwater, marine, and cultured fish. Their life cycle is direct.

Pleistophora spp most frequently parasitize muscle but can be found in the viscera. In addition to the extensive skeletal muscle involvement in this case, conference participants noted protozoal cysts and spores in the spinal cord, meninges, swim bladder, kidney, liver, gastrointestinal tract, and coelom.

Contributor. Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, Saskatchewan, Canada.

Suggested reading.

Roberts, R. J.: Fish Pathology. Bailliere Tindall, pp. 88-89, 170-173, 1978.

Rogers, W. A., and Gaines, J. L.: Lesions of protozoan diseases in fish. In: Pathology of Fishes, Ribelin, W. E., Migaki, G. (eds.). University of Wisconsin Press, pp. 128-130, 1975.

Slide 22

History. Genital lesions had been periodically observed in individual male and female rabbits (Oryctolagus cuniculus) in a large colony consisting of 1,294 rabbits from 15 inbred or partially inbred strains. Breeders were more frequently affected than subadult or nonbreeding adult rabbits. Dark-field microscopic examination of skin scrapings revealed corkscrew-shaped rods with a characteristic rolling

motion. Biopsy specimens were submitted from both male and female rabbits.

Gross Pathology. The most common clinical lesion was an ulcerative, erythematous, crusty plaque located at the mucocutaneous junction of the vulva, prepuce, or anus. Nasal and eyelid lesions were occasionally observed.

Diagnosis. Skin: Dermatitis, plasmacytic, chronic, diffuse, moderate, with acanthosis and multifocal erosions and ulcers, rabbit (Oryctolagus cuniculus), lagomorph.

Contributor's Comment and Conference Note. Unlike most members of the family Treponemataceae, Treponema cuniculi does not stain well with silver stains. Dark-field examination of wet mounts from scrapings of skin lesions is the easiest way to demonstrate T. cuniculi. Serological screening of rabbits using a test for human syphilis can be used to document previous infection in asymptomatic rabbits.

The rabbit is the only known natural host for Treponema cuniculi. Because the organism can penetrate intact mucous membranes, it can be transmitted venereally between adult breeders as well as vertically from infected does to their offspring. Therefore, either adults or young virgin rabbits can introduce venereal spirochetosis into a colony.

Contributor. The Jackson Laboratory, Bar Harbor, ME.

Suggested reading.

Cunliffe-Beamer, T. L., and Fox, R. R.: Venereal spirochetosis of rabbits: description and diagnosis. Lab. Anim. Sci. 31: 366-371, 1981.

Kraus, A. L., Weisbroth, S. H., Flatt, R. E., and Brewer, N.: Biology and diseases of rabbits. In: Laboratory Animal Medicine, Fox, J. G., Cohen, B. C., and Loew, F. W. (eds.). Academic Press, Inc., p. 220, 1984.

Slide 23

History. This tissue is from a 12-1/2-year-old male Schnauzer. His testes were atrophied and soft, his prostate was moderately enlarged, and both deferent ducts were enlarged and fluid-filled.

Gross Pathology. The deferent ducts were filled with purulent material, and there was bilateral testicular atrophy.

Diagnosis. Paradeferential connective tissue: Persistent mullerian duct, with cystic endometrial hyperplasia and suppurative inflammation, miniature schnauzer, canine.

Contributor's Comment and Conference Note. The lesions present in this dog are consistent with the persistent mullerian duct syndrome of miniature schnauzers. However, this syndrome is usually seen in dogs that are cryptorchids, and affected dogs have signs referable to a Sertoli cell tumor. No evidence of neoplasia was observed in the examined testicular sections.

This syndrome of male pseudohermaphroditism in the miniature schnauzer probably has a genetic basis. It is characterized by persistence of mullerian duct derivatives in male dogs with unilateral or bilateral cryptorchidism; Sertoli cell tumors and endometritis are often present.

Contributor. College of Veterinary Medicine, University of Illinois, Urbana, IL.

Suggested reading. Marshall, L. S., Oehlert, M. L., Haskins, M. E., Selden, J. R., and Patterson, D. F.: Persistent Mullerian duct syndrome in miniature schnauzers. J. Am. Vet. Med. Assoc. 181: 798-801, 1982.

Slide 24

History. The tissue submitted is from a 2-year-old male Sprague-Dawley rat that was part of a carcinogenicity study. The lesion is considered to be spontaneous and not related to treatment.

Gross Pathology. The specimen was a 2x2x3-cm mottled red and white mass located anterior to one kidney.

Diagnoses. 1. Adrenal gland: Ganglioneuroma, Sprague-Dawley rat, rodent. 2. Adrenal gland: Pheochromocytoma, malignant.

Contributor's Comment and Conference Note. Ganglion cells and supporting neural cells are characteristic of ganglioneuromas. Most ganglioneuromas are found in association with pheochromocytomas in the same adrenal; some authors consider them to be different parts of the same mixed tumor.

Both pheochromocytes (or chromaffin cells) and ganglion cells differentiate from primitive sympathogonia, and coincidental neoplasms of both cell types in the same adrenal have been reported previously. The pheochromocytoma in this case is considered to be malignant because it is invading cortex and capsule; benign pheochromocytomas are expansile neoplasms that compress and displace adjacent cortex and medulla.

Contributor. CIBA-GEIGY Corporation, Summit, NJ.

Suggested reading.

Reznik, G., and Ward, J. M.: Ganglioneuroma, adrenal, rat. In: Endocrine System, Jones, T. C., Mohr, U., Hunt, R. D. (eds.). Springer-Verlag, New York, pp. 30-34, 1983.

Strandberg, J. D.: Pheochromocytoma, adrenal medulla, rat. In: Endocrine System, Jones, T. C., Mohr, U., Hunt, R. D. (eds.). Springer-Verlag, New York, pp. 22-27, 1983.

Slide 25

History. This 45-day-old Sprague-Dawley rat developed ataxia, weakness, and loss of the righting reflex 3 days after receipt from a vendor.

Gross Pathology. There were a few petechial hemorrhages on the surface of the cerebral cortex.

Diagnosis. Cerebrum: Meningochorioencephalitis, pyogranulomatous, mild to moderate, with fungal elements, Sprague-Dawley rat, rodent.

Contributor's Comment and Conference Note. Cerebral phycomycosis is an unusual spontaneous lesion in laboratory rats; none of the other rats of the same shipment developed the disease. The most pathogenic of the phycomycotic organisms are the mucormyces (Mucor, Absidia, and Rhizopus). Phycomycosis generally involves the gastrointestinal or genital tract; dissemination to the brain is most often associated with immunosuppression or diabetes mellitus, particularly in uncontrolled diabetes in humans.

Contributor. Hershey Medical Center, Pennsylvania State University, Hershey, PA.

Suggested reading.

Moody, K. D., Griffith, J. W., and Lang, C. M.: Fungal meningoencephalitis in a laboratory rat. J. Am. Vet. Med. Assoc. 189: 1152-1153, 1986.

Rapp, J. P., and McGrath, J. T.: Mycotic encephalitis in weanling rats. Lab. Anim. Sci. 25: 477-480, 1975.

Slide 26

History. This is a necropsy specimen from a 12-year-old neutered female cocker spaniel. The dog was presented with anorexia, vomition, and diarrhea. Physical examination revealed a grade III/IV cardiac murmur. Radiographs showed mineralization of the iliac arteries and an

enlarged heart. Laboratory results included a serum phosphorus level of 11.1 mg/dl, BUN of 176 mg/dl, creatinine of 6.5 mg/dl, and albumin of 1.9 g/dl. Mean arterial blood pressure was 220 mHg. Ophthalmic examination revealed blindness, bilateral retinal hemorrhage, and retinal detachment.

Gross Pathology. The kidneys were small, firm, and finely irregular. There was a 5-cm lobulated mass in the right adrenal gland. Prominent left ventricular hypertrophy and pulmonary edema were also seen. The iliac arteries were mineralized.

Diagnoses. 1. Eye, retina and choroid: Arteriolosclerosis, multifocal, moderate, cocker spaniel, canine. 2. Eye, retina: Detachment and degeneration, multifocal, moderate, with hemorrhage.

Contributor's Comment and Conference Note. The causes and effects of hypertension in dogs are poorly understood. In the experience of the contributor, the major effect of systemic hypertension in dogs is on the eye. In addition, most hypertensive dogs have accompanying renal disease, most often with glomerular involvement; but its significance in the pathogenesis of hypertension is unknown (in humans, renal disease can be either a cause or an effect of hypertension).

This dog also had an adrenal gland tumor. The mass was not examined, but pheochromocytomas are sometimes associated with hypertension.

Morphologic changes in the choroidal and retinal vasculature vary between sections. Some arteriolar walls have a pink, homogenous, hyaline thickening; others contain smudgy, eosinophilic deposits or "fibrinoid change"; still others are thrombosed. The diagnosis of arteriolosclerosis encompasses this variety of changes.

Contributor. School of Veterinary Medicine, University of Wisconsin, Madison, WI.

Suggested reading.

Boldy, K.: Clinical and histologic ocular findings of systemic hypertension in dogs and cats. Trans. Amer. Coll. Vet. Ophthal., Vol. 14, 1983.

Morgan, R. V.: Systemic hypertension in four cats: ocular and medical findings. Trans. Amer. Coll. Vet. Ophthal., pp. 191-205, 1985.

Slide 27

History. This tissue is from a 3-week-old broiler chicken that was killed for necropsy 12 days after intratracheal inoculation with an infectious agent.

Gross Pathology. Air sacs were thickened and clouded by a serofibrinous exudate. The tracheal mucosa was congested and hemorrhagic. Both lungs were congested, edematous, and partially consolidated.

Diagnoses. 1. Lung: Pneumonia, granulomatous, focally extensive, severe, with protozoal organisms, chicken, avian. 2. Bronchi and air sacs: Bronchitis and air sacculitis, hyperplastic and lymphocytic, diffuse, moderate, with protozoal organisms.

Contributor's Comment and Conference Note. Cryptosporidium spp have several characteristics that distinguish them from the other coccidia that infect vertebrates: They develop on the microvillous borders of epithelial cells in an intracellular but extracytoplasmic location. They lack both host specificity and organ specificity. They have been variously reported in the intestine, stomach, bursa of Fabricius, bile ducts, and pancreatic ducts, in the upper respiratory tract, trachea, and bronchi, and in various mammalian, reptilian, and avian species.

Cryptosporidiosis is an emerging disease problem for the poultry industry; major respiratory and/or intestinal infections have been reported in chickens, turkeys, and quail.

Contributor. Lilly Research Laboratories, Greenfield, IN.

Suggested reading.

Current, W. L., Upton, S. J., and Haynes, T. B.: The life cycle of Cryptosporidium baileyi n. sp (Apicomplexa, Cryptosporidiidae) infecting chickens. J. Protozool. 33: 289-296, 1986.

Tarwid, J. N., Cawthorn, R. J., and Riddell, C.: Cryptosporidiosis in the respiratory tract of turkeys in Saskatchewan. Avian Dis. 29: 528-532, 1985.

Slide 28

History. This 2-year-old female Bernese mountain dog presented with a history of polyuria, polydipsia, hematuria, and abdominal distension of 2 days' duration. The dog was febrile and slightly icteric.

Gross Pathology. The sclera and oral mucosa were yellow. Liver and spleen were moderately enlarged with many small white nodules on the surface and cut surface. Superficial and visceral lymph nodes were

prominent, bulged on cut section, and were mottled tan and red. The lungs were red and spongy and did not collapse. Melena was present in the colon.

Diagnosis. Liver: Histiocytic sarcoma, Bernese mountain dog, canine.

Contributor's Comment and Conference Note. Neoplastic histiocytic infiltrates were present in the liver, spleen, superficial and visceral lymph nodes, and lung. The hepatic infiltrates and subsequent decreased hepatic function likely caused the ascites, icterus, and melena. There were no skin or central nervous system lesions. The sites and features of the infiltrates are suggestive of malignant histiocytosis of Bernese mountain dogs.

Although some participants interpreted the lesions as being inflammatory, the moderator stressed that the neoplastic nature of the infiltrating histiocytic cells could be recognized on the basis of the cellular atypia, the frequent, occasionally bizarre, mitotic figures, and the presence of multinucleate cells and cells with bizarre nuclei.

Contributor. Department of Comparative and Experimental Pathology, University of Florida, Gainesville, FL.

Suggested reading. Moore, P. F., and Rosin, A.: Malignant histiocytosis of Bernese mountain dogs. Vet. Pathol. 23: 1-10, 1986.

Slide 29

History. This 7-month-old castrated male domestic shorthair cat was anorectic and febrile and had generalized lymphadenopathy. The cat was euthanatized and presented for necropsy.

Gross Pathology. Mandibular, tracheobronchial, and mesenteric lymph nodes were moderately to markedly enlarged. Multiple nodular densities were distributed throughout the lung.

Diagnoses. 1. Lymph node: Lymphadenitis, granulomatous, diffuse, severe, domestic shorthair, feline. 2. Small intestine: Enteritis, granulomatous, diffuse, mild.

Contributor's Comment and Conference Note. The organism isolated from this case appears to be a member of the Mycobacterium avium complex. The granulomatous lesions and the presence of myriads of acid-fast bacilli in an initial lymph node biopsy prompted consideration of feline leprosy. However, leprosy typically affects skin and cutaneous nerves, and these were not involved in this case. Granulomatous lesions

were present in lung, bronchial lymph node, liver, spleen, small intestine, mesenteric lymph node, popliteal lymph node, and bone marrow.

Macrophages, epithelioid cells, and Langhans-type giant cells formed multifocal granulomas (lung, liver, and bone marrow) or occurred as solid sheets of cells replacing the normal tissue architecture (lymph nodes, spleen, and bone marrow). Lymphocytes and plasma cells were notably absent or sparse in all tissues.

Although disseminated infections with M. avium complex organisms have been reported in several mammalian species, including cats, cattle, dogs, horses, pigs, and primates (including man), cats and dogs are generally considered to be highly resistant to the organism, as disease is rarely reported.

Contributor. College of Veterinary Medicine, Iowa State University, Ames, IA.

Suggested reading.

Drolet, R.: Disseminated tuberculosis caused by Mycobacterium avium in a cat. J. Am. Vet. Med. Assoc. 189: 1336-1337, 1986.

Greene, C. E.: Clinical Microbiology and Infectious Diseases of the Dog and Cat. W. B. Saunders Co., pp. 633-645, 1984.

Slide 30

History. This adult female white rat was one of 15 rats bought from a wholesale dealer. Two days later this rat was sneezing and had a bloody nasal discharge. It was submitted for euthanasia and necropsy.

Gross Pathology. Both lungs were consolidated with multiple abscesses in the posterior portions, which compressed the adjacent parenchyma. The right hock was swollen, but no discharge was noted grossly. Streptobacillus sp was isolated from the lungs; no other pathogens were isolated from the lungs or the hock.

Diagnosis. Lung: Bronchopneumonia, chronic and suppurative, multifocal to coalescing, moderate, with multiple bronchiectatic abscesses, rat, rodent.

Contributor's Comment and Conference Note. Streptobacillus moniliformis is a pleomorphic, gram-negative bacterium that is a normal commensal of the nasopharyngeal area of rats. It is an occasional cause of respiratory disease, joint disease, and other inflammatory lesions in turkeys, guinea pigs, rats, and mice. In this particular case, Mycoplasma sp was not isolated and the primary cause of bronchopneumonia appeared to be Streptobacillus moniliformis.

Although respiratory disease in the rat often has a multifactorial etiology, the primary pathogen is most commonly Mycoplasma pulmonis. Lesions occur primarily in the major airways and are characterized microscopically by neutrophilic exudation creating bronchiectatic abscesses, by bronchial epithelial hyperplasia and hypertrophy, and by peribronchial and peribronchiolar lymphoid proliferation. Because of the presence of all of these features in this case and of the failure to isolate M. pulmonis, the moderator stated that mycoplasmosis should be suspected at least as a contributing factor.

Contributor. College of Veterinary Medicine, Colorado State University, Fort Collins, CO.

Suggested reading.

Kohn, D. F., and Barthold, S. W.: Biology and diseases of rats. In: Laboratory Animal Medicine, Fox, J. G., Cohen, B. J., Loew, F. M. (eds.). Academic Press, Inc., pp. 99-111, 1984.

Schoeb, T. R., and Lindsay, J. R.: Murine respiratory mycoplasmosis, lung, rat. In: Respiratory System, Jones, T. C., Mohr, U., Hunt, R. D. (eds.). Springer-Verlag, pp. 213-218, 1985.

Slide 31

History. This is tissue from a 67-week-old female B6C3F1 mouse that was found dead. It was a control animal in a chronic carcinogenicity study.

Gross Pathology. The left ovary was replaced by a multilobulated, cystic, hemorrhagic mass. There were also disseminated peritoneal metastases.

Diagnosis. Ovary (per contributor): Yolk sac carcinoma, B6C3F1 mouse, rodent.

Contributor's Comment and Conference Note. Spontaneous ovarian yolk sac carcinomas have been described in B6C3F1 and CDI mice. The tumors originate from ovarian germ cells. The abundant extracellular, PAS-positive matrix also stains positive for laminin and represents Reichert's membrane, which is the basement membrane secreted by the parietal cells of the yolk sac.

The moderator suggested that the lack of identifiable ovarian tissue, along with the glandlike epithelial structures present in some sections, should cause one to consider a primary uterine yolk sac carcinoma in the differential diagnosis. Yolk sac carcinomas primary to the uterus arise in the endometrial stroma.

Contributor. Warner-Lambert/Parke-Davis Research Institute, Ann Arbor, MI.

Suggested reading.

Majeed, S. K., Alison, R. H., Boorman, G. A., and Gopinath, C.: Ovarian yolk sac carcinoma in mice. Vet. Pathol. 23: 776-778, 1986.

Stewart, H. L., Sass, B., Deringer, M. K., Dunn, T. B., Liotta, L. A., and Togo, S.: Pure yolk sac carcinoma of the mouse uterus: report of 8 cases. J. Natl. Cancer Inst. 73: 115-122, 1984.

Slide 32

History. This is tissue from an 8-month-old female BALB/cJ mouse that had a large mass located in its ventral cervical region.

Gross Pathology. A well-circumscribed, fluctuant, subcutaneous mass was present in the ventral cervical area attached to the salivary glands. It was 2.3x1.9 cm and consisted of a thin wall with a large cavity containing green-brown fluid.

Diagnosis. Salivary gland: Myoepithelioma, BALB/cJ mouse, rodent.

Contributor's Comment and Conference Note. The gross, microscopic, and ultrastructural features of this neoplasm are consistent with what has been classified as a myoepithelioma of BALB/c mice. In the contributor's experience, this neoplasm has been diagnosed only in BALB/cJ mice but not in other BALB substrains.

Contributor. The Jackson Laboratory, Bar Harbor, ME.

Suggested reading. Burger, G. T., Frith, C. H., and Townsend, J. W.: Myoepithelioma, salivary glands, mouse. In: Digestive System, Jones, T. C., Mohr, U., and Hunt, R. D. (eds.). Springer-Verlag, pp. 185-189, 1985.

Slide 33

History. One hundred fifty BALB/c mice were received from a commercial vendor. Fifty of the newly received mice were injected intraperitoneally with Pristane to promote ascitic fluid production by transplanted hybridomas. During the third week after arrival, both treated and untreated mice began dying. After 1 week, only 11 of the 150 mice were left; these were submitted for necropsy. They were lethargic and had a rapid respiratory rate, "humped" posture, rough coat of hair, and mild ocular discharge.

Gross Pathology. Three of the mice had enlarged spleens and multiple slightly depressed light-tan, pinpoint to 1-mm foci randomly distributed in the liver. One mouse had similar foci in the spleen.

Diagnosis. Liver: Hepatitis, necrotizing and suppurative, acute, multifocal, moderate, BALB/c mouse, rodent.

Contributor's Comment and Conference Note. Microscopic findings in the 11 mice examined after death were hepatitis in 7, multifocal necrosuppurative to pyogranulomatous enteritis and cecitis in 8, multifocal necrosuppurative splenitis with venous thrombosis in 7, and multifocal necrosuppurative mesenteric lymphadenitis in 4.

Salmonella was isolated from the liver, gallbladder, or cecum of all 11 mice. The organism was identified as Salmonella enteritidis serotype enteritidis by the Diagnostic Bacteriology Laboratory, National Veterinary Services Laboratories, Ames, IA. Because of the potential hazard of transmission of salmonella to other animals and personnel, the mice were quarantined immediately.

All 11 mice had antibodies (by ELISA) to mouse hepatitis virus. Although the contributor interpreted this as an unimportant finding in this outbreak, the exact role of mouse hepatitis virus cannot be determined.

Differential diagnosis based on the gross lesions and history should include mousepox, salmonellosis, Tyzzer's disease, mouse hepatitis, corynebacteriosis (Corynebacterium kutscheri), and streptobacillosis (Streptobacillus moniliformis). Conference participants also suggested that reovirus type 3, Pseudomonas aeruginosa, Streptococcus spp, Escherichia coli, or lymphocytic choriomeningitis virus might cause similar gross or microscopic lesions in susceptible mouse strains.

Contributor. Department of Comparative Medicine, University of Alabama at Birmingham, Birmingham, AL.

Suggested reading.

Ganaway, J. R.: Bacterial and mycotic diseases of the digestive system. In: The Mouse in Biomedical Research, Vol II, Foster, H. L., Small, J. D., and Fox, J. G. (eds). Academic Press, Inc., pp. 1-20, 1982.

Ganaway, J. R.: Salmonellosis, liver, mouse, rat, hamster. In: Digestive System, Jones, T. C., Mohr, U., and Hunt, R. D. (eds.). Springer-Verlag, pp. 170-173, 1985.

Slide 34

History. This is tissue from a Guernsey-Angus cross bovine fetus that was aborted at 8 months' gestation.

Gross Pathology and Laboratory Results. The liver was mildly swollen. The lungs were firm and did not collapse, with occasional small, raised, subpleural, emphysematous bubbles on all lobes. Placenta was not available for examination. Tritrichomonas foetus was observed and isolated from fetal abomasal contents.

Diagnosis. Lung: Pneumonia, pyogranulomatous, diffuse, severe, with intracellular and extracellular protozoa, Guernsey/Angus cross, bovine.

Contributor's Comment and Conference Note. Tritrichomonas foetus is a common cause of bovine infertility and an occasional cause of abortion and pyometra. Most abortions occur in the first half of gestation. Diagnosis is made by observing and/or culturing the organisms from cervical mucus, preputial washings or scrapings, placental fluid, or fetal abomasal contents. Although the organism can produce vaginitis, endometritis, or placentitis, no specific fetal lesions are reported. However, in this case, the lung contains a marked inflammatory infiltrate composed of neutrophils, macrophages, and multinucleated giant cells in alveolar spaces and bronchioles. Pale staining crescent- to pear-shaped organisms are present within macrophages and giant cells and are free in the lung parenchyma. Free and phagocytized pigmented debris (meconium) is present in airways. The late gestational age of the fetus in this case was unusual.

Contributor. Montana Veterinary Diagnostic Laboratory, Bozeman, MT.

Suggested reading. Rhyan, J. C., Stackhouse, L. L., and Quinn, W. J.: Fetal and placental lesions in bovine abortion due to Tritrichomonas foetus. Vet. Pathol. 25: 350-355, 1988.

Slide 35

History. This 4-week-old male Holstein calf with a history of pyrexia and failure to thrive was killed and presented for necropsy.

Gross Pathology. Slightly elevated, coalescing, erythematous macules were found throughout the oral cavity, including lips, gums, dental pad, and hard palate. The centers of some of the proliferative lesions had partially sloughed, leaving slight depressions with raised reddened margins. Similar foci were on the lateral, ventral, and dorsal surfaces of the tongue.

Diagnosis. Tongue and buccal mucosa: Stomatitis, proliferative and necrotizing, acute, multifocal, moderate, with ballooning

degeneration and eosinophilic intracytoplasmic inclusion bodies, Holstein, bovine.

Contributor's Comment and Conference Note. The lesions of bovine papular stomatitis may be limited to the oral cavity, as in this case, or may extend onto the muzzle or, occasionally, down into the esophagus, rumen, reticulum, and omasum. In contradiction to some descriptions, the lesions were present on the dorsal surface of the tongue in this case. Although bovine papular stomatitis is generally of little clinical significance, it shares certain characteristics with the other diseases that cause erosive and vesicular lesions in the bovine and must be differentiated from them.

Contributor. School of Veterinary Medicine, University of Wisconsin, Madison, Wisconsin.

Suggested reading. Barker, I. K., and Van Dreumel, A. A.: The alimentary system. In: Pathology of Domestic Animals, Vol 2, Jubb, K. V. F., Kennedy, P. C., Palmer, N. (eds.). 3rd Ed., Academic Press, Inc., pp. 90-114, 1985.

Slide 36

History. This is tissue from a 2-month-old male Brahman calf. It was one of four calves lost in a herd of 500 cattle. All four calves were approximately 60 days of age and were reportedly okay one day but found dead the next.

Gross Pathology and Laboratory Results. The abomasal mucosa was bright red, with several irregular areas of necrosis and ulceration. On section, the submucosa was distended up to 4 cm by numerous gas pockets and a serofibrinous exudate. Fluorescent antibody testing was positive for Clostridium septicum, and anaerobic culture yielded Clostridium perfringens.

Diagnosis. Abomasum: Abomasitis, acute, diffuse, severe, transmural, with marked submucosal emphysema and edema, Brahman, bovine.

Contributor's Comment and Conference Note. Clostridial abomasitis due to Clostridium septicum (braxy/bradsot) is primarily a cold weather disease of yearling sheep in hilly areas of Britain, Ireland, Norway, and the Faroes. Within the last 5 to 6 years, there have been several reports of abomasitis in neonatal calves in the United States. Although Clostridium septicum has been isolated from a few animals, C. perfringens is reported as the most common isolate. Most cases have

occurred during the colder months, but the two separate occurrences seen by the contributor have been in warm weather. Ingestion of cold fodder may somehow be involved in the pathogenesis of braxy, the icy feed presumably causing devitalization of the mucosa and allowing bacterial entry.

Contributor. College of Veterinary Medicine, Mississippi State University, Mississippi State, MS.

Suggested reading.

Barker, I. K., and Van Dreumel, A. A.: The alimentary system. In: Pathology of Domestic Animals, Vol 2. Jubb, K. V. F. , Kennedy, P. C., Palmer, N. (eds.) 3rd Ed., Academic Press, Inc., pp. 149-155, 1985.

Roeder, B. L., Chengappa, M. M., Nagaraja, T. G., Avery, T. B., and Kennedy, G. A.: Isolation of Clostridium septicum from neonatal calves with ruminal and abomasal tympany, abomasitis, and abomasal ulceration. J. Am. Vet. Med. Assoc. 190: 1550-1555, 1987.

Slide 37

History. This 4-day-old male Holstein calf had a history of anorexia and scouring.

Gross Pathology. There were discrete, pale areas in the ventricular septal wall and left ventricular free wall. The intestinal tract was atonic and contained foamy yellow material.

Diagnosis. Heart: Mesothelioma, Holstein, bovine.

Contributor's Comment and Conference Note. There is a locally extensive replacement of myofibers by tubular and acinar structures, which are lined by low cuboidal epithelium, usually with an apical bleb of cytoplasm. The epithelial cells have large vesicular nuclei with, usually, a single prominent nucleolus. Mitotic figures are rare.

Conference participants noted that the microscopic features of this case are similar to mesothelioma of the atrioventricular (A-V) node described in the human literature. These neoplasms often replace all or part of the A-V node and extend inward into the atrial septum and downward into the A-V bundle. They are thought to arise from mesothelial rests and not as extensions from the pericardial surface. Primary cardiac neoplasms that are morphologically similar have also been observed in several rat strains; both F344 and NZR/Gd rats have been reported as having atriocaval mesotheliomas.

Contributor. Utah State University, Logan, Utah.

Suggested reading.

Alison, R. H., Elwell, M. R., Jokinen, M. P, Dittrich, K. L., and Boorman, G. A.: Morphology and classification of 96 primary cardiac neoplasms in Fischer 344 rats. Vet. Pathol. 24: 488-494, 1987.

McAllister, H. A., and Fenoglio, J. J.: Tumors of the Cardiovascular System. Atlas of Tumor Pathology, Second Series, Fascicle 15, Armed Forces Institute of Pathology, pp. 52-59, 1978.

Slide 38

History. This 6-month-old wapiti (North American elk) hind had shown incoordination for 2 weeks before being found in recumbency and with evidence of diarrhea. In spite of treatment with antibiotics, fluids, and copper, the animal died.

Gross Pathology. Body condition was poor, with depletion of fat reserves.

Diagnosis. Cerebellum, Purkinje cells, neuronal processes: Swelling and vacuolation, diffuse, moderate, with multifocal perikaryon degeneration and loss, wapiti (Cervus elaphus mannitobensis), cervine.

Contributor's Comment and Conference Note. This case is an example of ryegrass staggers. This disease occurs each autumn in New Zealand in sheep and cattle grazing perennial ryegrass (Lolium perenne L) and has recently been described in Canadian wapiti (Cervus elaphus mannitobensis). Wapiti appear to be more susceptible to the disease than are red deer.

The causative toxic principles of ryegrass staggers are mycotoxins produced by endophytic fungi present in the vegetation and seeds of perennial ryegrass. These mycotoxins, lolitrem A and B, have been isolated and characterized and are potent neurotoxins.

Histologically, there are swollen Purkinje cell axons and dendrites containing large clear vacuoles within the cerebellar granular and molecular layers. This vacuolization is not a feature of the disease in sheep or cattle, but has been reported in several cases of cervine ryegrass staggers.

Contributor. Palmerston North Animal Health Laboratory, Palmerston North, New Zealand.

Suggested reading.

Brooks, H. V., and Cahill, J. J.: The susceptibility of Canadian wapiti to ryegrass staggers. N. Z. Vet. J. 33: 126, 1985.

Sullivan, N. D.: The nervous system. In: Pathology of Domestic Animals, Vol 1, Jubb, K. V. F., Kennedy, P. C., Palmer, N. (eds.). 3rd Ed., Academic Press, Inc., pp. 263-274, 1985.

Slide 39

History. This 4-week-old male broad-breasted white turkey was inoculated intranasally at 1 day of age with a respiratory pathogen. The turkey was smaller than noninfected hatchmates.

Gross Pathology and Laboratory Results. At necropsy there was brownish discoloration of periocular and perinasal feathers, moderate mucopurulent exudate in the nasal sinuses and trachea, and moderate dorsoventral flattening of the cranial cervical trachea. Quantitative bacterial culture of the trachea revealed $1x10^8$ colony-forming units of Bordetella avium per centimeter of trachea.

Diagnosis. Trachea: Tracheitis, subacute, diffuse, mild, with epithelial hyperplasia and cilia-associated bacteria, turkey, avian.

Contributor's Comment and Conference Note. Bordetellosis in turkeys (turkey coryza) is generally a mild disease that is restricted to the upper airways. It is highly contagious, however, causing oculonasal exudation, sneezing, dyspnea, tracheal collapse, and decreased rate of weight gain in young turkeys. The most characteristic histologic lesions include loss of ciliated epithelium with replacement by immature mucous cells, depletion of mucus from goblet cells and alveolar mucous glands, bacterial colonies associated with patches of ciliated epithelium, dysplasia and squamous metaplasia of tracheal epithelium, and mild to moderate mucosal infiltration of heterophils, lymphocytes, and plasma cells with fibrinopurulent to catarrhal exudate in the tracheal lumen.

The tracheal lesions observed in poults experimentally infected with Bordetella avium (formerly Alcaligenes faecalis) resemble the bordetellosis lesions seen in other species: the bacteria infect ciliated respiratory epithelium, infection is persistent despite humoral antibody response, and there is distorted growth of submucosal cartilage.

Contributor. College of Veterinary Medicine, Iowa State University, Ames, IA.

Suggested reading.

Arp, L. H. , and Cheville, N. F.: Tracheal lesions in young turkeys infected with Bordetella avium. Am. J. Vet. Res. 45: 2196-2200, 1984.

Arp, L. H., and Fagerland, J. A.: Ultrastructural pathology of Bordetella avium infection in turkeys. Vet. Pathol. 24: 411-418, 1987.

Slide 40

History. This is tissue from a 7-year-old cow.

Gross Pathology. Large portions of the lungs were slightly reddened and contained multiple 4-mm-diameter firm, white nodules.

Diagnosis. Lung: Pneumonia, fibrinonecrotic, chronic-active, multifocal and focally extensive, severe, with amoebic trophozoites and cysts, breed unspecified, bovine.

Contributor's Comment and Conference Note. The causative agent present in these sections is the amoebic protozoan, Hartmannella sp (Acanthamoeba sp). Histologically, the organisms appear in two forms, both usually found in areas of necrosis. The most common form is the trophozoite. It is round, eosinophilic, and thin-walled; measures 9 to 12 um in diameter; often has a centrally located basophilic karyosome; and resembles a degenerate macrophage. The second form of Hartmannella is the cyst form. It is slightly smaller (9-10 um), has a thick capsule, and is densely basophilic. The similar morphologic features of Hartmannella spp and Acanthamoeba spp make differentiation of these organisms difficult in H&E-stained sections.

Clinical disease caused by the protozoal organism Hartmannella has been infrequently reported in man, dogs, monkeys, and cattle. The organism has an affinity for the lung, causing a necrohemorrhagic or gangrenous pneumonia, but lesions have also been reported in the heart, liver, and pancreas of dogs and in the brain of man.

Contributor. USDA/FSIS, Beltsville, MD.

Suggested reading.

Ayers, K. M., Billups, L. H., and Garner, F. M.: Acanthamoebiasis in a dog. Vet. Pathol. 9: 221-226, 1972.

McConnell, E. E., Garner, F. M., and Kirk, J. H.: Hartmannellosis in a bull. Path. Vet. 5: 1-6, 1968.

Slide 41

History. At 3 months of age this female Jersey calf began to lose weight and overall body condition. The calf had chronic diarrhea during the following month. Because several other calves on the premises had similar clinical signs, this calf was euthanized for diagnostic purposes.

Gross Pathology and Laboratory Results. Rumen contents were watery and yellow-tan. Feces in the cecum and colon were more liquid than normal, and there was slight reddening of the mucosa. In some

segments of spiral colon, there were prominent lymphoid follicles. Bacterial culture of the colon yielded Escherichia coli.

Diagnoses. 1. Colon: Colitis, subacute, diffuse, mild, with diffuse superficial mucosal colonization by bacteria and multifocal submucosal microherniation, Jersey, bovine. 2. Colonic blood vessels, tunicae submucosa and muscularis: Vasculitis, circumferential, necrotizing, acute, multifocal, severe.

Contributor's Comment and Conference Note. Enteropathogenic E. coli does not produce the classical E. coli enterotoxins (heat-labile and heat-stable) and is not invasive; diarrhea is caused by unknown mechanisms. Some strains cause a distinctive histologic and ultrastructural lesion characterized by effacement of microvilli, typically without evidence of epithelial cell invasion. The bacteria are closely adherent to the apical cytoplasmic membrane, with the membrane "cupping" or partially enveloping the bacteria. Strains of E. coli that produce this lesion have been termed "attaching and effacing E. coli" (AEEC).

Attaching and effacing E. coli isolated from diarrheic calves and humans elaborate one or more biologically distinct cytotoxins. One of these toxins, Shiga-like toxin I or Verotoxin I, apparently is identical to the toxin produced by Shigella dysenteriae type I (Shiga toxin).

The ability to infect the 4-month-old calf in the present case probably indicates an immunocompromised host; this is suggested by lymphoid depletion in submucosal lymphoid nodules. Bovine virus diarrhea virus was suspected as the cause of lymphoid depletion, but it was not identified by virologic studies. The relationship between the bacteria studding the mucosal surface and the prominent multifocal vasculitis in the intestinal wall was not clear to conference participants.

Contributor. College of Veterinary Medicine, University of Minnesota, St. Paul, MN.

Suggested reading.

Hall, G. A., Reynolds, D. J., Chanter, N., Morgan, J. H., Parsons, K.R., Debney, T. G., Bland, A. P., and Bridger, J. C.: Dysentery caused by Escherichia coli (S102-9) in calves: natural and experimental disease. Vet. Pathol. 22: 156-163, 1985.

Pospischil, A., Mainil, J. G., Baljer, G., and Moon, H. W.: Attaching and effacing bacteria in the intestines of calves and cats with diarrhea. Vet. Pathol. 24: 330-334, 1987.

Slide 42

History. Mice from a recent shipment began dying during the quarantine period with signs of respiratory disease. This is tissue from a 7-month-old obese female littermate of OB/OB strain C57BL/6J mouse.

Gross Pathology. The lungs did not collapse normally, and there was consolidation of the cranial-ventral lung field.

Diagnosis. Lung: Bronchopneumonia, suppurative, chronic, multifocal, moderate, with peribronchial, peribronchiolar, and perivascular lymphoplasmacytic infiltrates and cilia-associated bacilli, mouse, rodent.

Contributor's Comment and Conference Note. The filamentous cilia-associated respiratory (CAR) bacilli within the bronchiolar lesions stained slightly basophilic with H&E, gram-negative with Brown & Hopps, and positive with PAS and Warthin-Starry stains. The bacteria also stained positive with CAR bacillus-specific immunoperoxidase stains. Obese mice have impaired immunity and other problems associated with diabetes mellitus; they may be more susceptible to infection with CAR bacillus than are other strains of mice or rats. Other mice in this group also had histologic and serologic evidence of Sendai virus infection; reports of spontaneous CAR bacillus infection of rats indicate that it is often a co-pathogen with Mycoplasma pulmonis and murine respiratory viruses.

The etiologic significance and prevalence rates of CAR bacillus have not been entirely elucidated. The organism remains unclassified, but is presumably related to the "gliding bacteria."

Contributor. Hershey Medical Center, Pennsylvania State University, Hershey, PA.

Suggested reading. Ganaway, J. R., Spencer, T. H., Moore, T. D., and Allen, A. M.: Isolation, propagation, and characterization of a newly recognized pathogen, cilia-associated respiratory bacillus of rats, an etiological agent of chronic respiratory disease. Infect. Immun. 47: 472-479, 1985.

Slide 43

History. This is tissue from an ovine fetus.

Gross Pathology and Laboratory Results. There were multiple randomly distributed varisized foci of hepatic necrosis from which Campylobacter fetus was isolated.

Diagnosis. Liver: Hepatitis, necrotizing, acute, multifocal, moderate, breed unspecified, ovine.

Contributor's Comment and Conference Note. Members of the genus Campylobacter are small, curved gram-negative bacilli. As pathogens, they are generally associated either with genital infections characterized by infertility and abortion or with intestinal disease characterized by enteritis and diarrhea. Multifocal hepatic lesions in an aborted ovine fetus are highly suggestive of campylobacteriosis; both the gross and microscopic lesions in this case are typical.

Contributor. North Dakota State University, Fargo, ND.

Suggested reading.

Hall, R. F.: Infectious abortions in ewes. Comp. Cont. Ed. 4: S216-S221, 1982.

Hedstrom, O. R., Sonn, R. J., Lassen, E. D., Hultgren, B. D., Crisman, R. O., Smith, B. B., and Snyder, S. P.: Pathology of Campylobacter jejuni abortion in sheep. Vet. Pathol. 24: 419-426, 1987.

Slide 44

History. A 4-month-old female Angus calf was presented for necropsy. The calf was found dead on the morning of submission. Six weeks previously the animal had been moved from its birthplace in Wheatland, Wyoming (elevation, 4,748 ft) to a mountain pasture (approx. elevation, 8,000 ft) for summer grazing.

Gross Pathology. There was moderate ventral subcutaneous edema. The thoracic cavity contained approximately 1 liter of excess fluid. The lungs were variably atelectatic and mottled red, and a scant amount of sanguineous foam exuded on cut surface. The right ventricle was moderately to markedly dilated, and its wall was moderately thinned. The peritoneal cavity contained approximately 10 liters of excess fluid. There was marked edema of the mesentery and walls of tubular organs in the alimentary tract. The liver was slightly shrunken, firm, and nodular and had a pale "nutmeg" appearance on cut surface.

Diagnosis. 1. Lung: Congestion and hemorrhage, multifocal, moderate, with erythrophagocytosis and hemosiderosis, Angus, bovine. 2. Lung, arteries and arterioles: Adventitial proliferation, multifocal, mild. 3. Liver: Fibrosis, centrolobular, bridging, diffuse, moderate to severe, with hemorrhage. 4. Liver: Vacuolar change, diffuse, severe, with cholestasis.

Contributor's Comment and Conference Note. The history and gross and histopathological lesions are compatible with a diagnosis of right congestive heart failure secondary to high altitude-induced pulmonary hypertension (high mountain disease). This case is somewhat unusual in the lack of remarkable medial hypertrophy in pulmonary arteries and arterioles, which show only mild adventitial changes.

High-altitude disease (brisket disease or mountain sickness) is the ultimate result of the hypoxia-induced pulmonary arterial constriction and hypertrophy that occur in the low atmospheric densities of high altitudes. The ensuing pulmonary hypertension eventually causes right heart failure (cor pulmonale). Cattle are particularly susceptible, in part, at least, because of the well-developed muscular layers in their pulmonary vasculature.

There was disagreement among conference participants regarding the severity of vascular lesions. The moderator considered that medial hypertrophy and adventitial proliferation were prominent features. Although the adventitial changes were recognized by most participants, increased thickness of the vascular musculature was not considered significant in all sections.

Contributor. Wyoming State Veterinary Laboratory, Laramie, WY.

Suggested reading. Alexander, A. F., and Jensen, R.: Pulmonary vascular pathology of bovine high mountain disease. Am. J. Vet. Res. 24: 1098-1111, 1963.

Slides 45 & 46

History. The penile sheath of this 9-1/2-year-old male English pointer canine began to swell in March. In June, his right rear leg began to swell. During exploratory surgery in August, a mass was noted on the dorsal abdominal wall, and a biopsy was performed. The peritoneum was then closed, the parapreputial area was incised, and additional biopsy specimens were taken.

Gross Pathology. Ventral subcutaneous edema and edema of the right pelvic limb were present, and fluid-filled cavities were located retroperitoneally, posterior to the kidneys.

Diagnosis. Skin and subcutis: Lymphangiosarcoma, English pointer, canine.

Contributor's Comment and Conference Note. This is a rare neoplasm that has been reported infrequently in the dog and cat. Neoplasms of lymphatic and blood vascular origin are similar in appearance; distinguishing between them cytologically can be difficult.

Unlike neoplasms of lymphatic origin, hemangiomas and hemangiosarcomas are not generally associated with significant amounts of edema and their endothelial-lined spaces are blood filled. However, focal hemorrhage into the channels of neoplasms of lymphatic origin or suffusion with blood at the time of biopsy must be reconciled.

Contributor. College of Veterinary Medicine, Kansas State University, Manhattan, KS.

Suggested reading.

Franklin, R. T., Robertson, J. J., Thornburg, L. P.: Lymphangiosarcoma in a dog. J. Am. Vet. Med. Assoc. 184: 474-475, 1984.

Walsh, K. M., Abbott, D. P.: Lymphangiosarcoma in two cats. J. Comp. Path. 94: 611-614, 1984.

Slides 47 & 48

History. In a litter of nine 2-week-old mixed-breed pigs, two were found dead, two were comatose, and the others were febrile, depressed, incoordinate, and shivering. The comatose pigs were presented for necropsy, and the others were treated with penicillin. The following day, CNS disturbances including seizures and convulsions were seen and two more pigs were necropsied.

Gross Pathology and Laboratory Results. One of the pigs necropsied on the first day had mild edema of the mesocolon, and the other had an ulcer on the ventral surface of the tongue. One pig necropsied on the second day had multiple pinpoint gray foci in the liver and petechiae on the palatine tonsil and lung. Gross lesions were not found in the other pig. Pseudorabies virus was isolated from submitted specimens.

Diagnoses. 1. Cerebrum, cerebellum, brain stem: Meningoencephalitis, nonsuppurative, multifocal, moderate, with multifocal neuronal necrosis and eosinophilic intranuclear inclusion bodies, mixed-breed, porcine. 2. Lung: Pneumonia, interstitial, subacute, diffuse, mild, with multifocal necrosis. 3. Liver: Hepatitis, necrotizing, multifocal, mild, with eosinophilic intranuclear inclusion bodies.

Contributor's Comment and Conference Note. These specimens are from pigs necropsied on the second day; comparable lesions were found in tissues from the initial presentation. In addition to the lesions present here, necrotizing lesions were seen in the adrenal glands and periadrenal ganglia, with intranuclear inclusion bodies in the adrenal. The lesions are representative of pseudorabies virus infection in piglets.

Pseudorabies virus is exceptional among the herpesviruses because of its broad host range. Although primarily a pathogen of swine, the virus can naturally or experimentally infect numerous mammalian and avian species. The virus is pantropic, affecting tissues derived from all embryonic layers. Its neurotropism allows it to spread to the brain by neural routes in most species, and a viremia that is generally of low titer produces visceral dissemination.

Contributor. Iowa State University, Ames, IA.

Suggested reading. Gustafson, D. P.: Pseudorabies. In: Diseases of Swine, Leman, A. D., Straw, B., Glock, R. D., Mengeling, W. L., Penny, R. H. C., Scholl, E. (eds.). 6th Ed., Iowa State University Press, pp. 274-289, 1986.

Slide 49

History. This 112-week-old male Fischer 344 rat was a control in a 2-year carcinogenesis bioassay. It was killed after being observed to be "sluggish" and unable to right itself.

Diagnosis. Cerebellum: Granular cell tumor, Fischer 344 rat, rodent.

Contributor's Comment and Conference Note. Granular cell tumors in rats are generally located within the cranial cavity adjacent to the meninges of the cerebrum or cerebellum. The presence of prominent PAS-positive, diastase-resistant granules is their histologic hallmark. They stain positive for vimentin and negative for both S-100 protein and glial fibrillary acid protein by immunohistochemical procedures. These characteristics are shared with meningothelial meningiomas and suggest a common progenitor cell, the meningothelial arachnoid cell.

Contributor. NIEHS, Research Triangle Park, NC.

Suggested reading.

Mitsumori, K., Dittrich, K. L., Stefanski, S., Talley, F. A., and Maronpot, R. R.: Immunohistochemical and electron microscopic study of meningeal granular cell tumors in rats. Vet. Pathol. 24: 356-359, 1987.

Mitsumori, K., Maronpot, R. R., and Boorman, G. A.: Spontaneous tumors of the meninges in rats. Vet. Pathol. 24: 50-58, 1987.

Slide 50

History. This tissue is from a 6-month-old male Sprague-Dawley rat that died unexpectedly.

Gross Pathology and Laboratory Results. The lungs were diffusely reddened, with numerous 3- to 10-mm-diameter tan-white, firm, coalescing foci scattered throughout. A thin, shaggy, white, friable exudate covered some areas of the pleural surface. Corynebacterium kutscheri was cultured from samples of lung.

Diagnosis. Lung: Bronchopneumonia, necrotizing, subacute, multifocal to coalescing, severe, with numerous bacterial colonies and mild fibrinous pleuritis, Sprague-Dawley rat, rodent.

Contributor's Comment and Conference Note. In general, the morphologic changes were typical of pulmonary corynebacteriosis (pseudotuberculosis) in rats. The multifocal necrotic lesions randomly distributed throughout the lungs contain fibrin, intralesional bacterial colonies, and cellular and nuclear debris, as well as mixed infiltrates of neutrophils, macrophages, smaller numbers of lymphocytes, and occasional plasma cells. A mild focal fibrinous pleuritis is present in some areas.

Contributor. National Institutes of Health, Bethesda, MD.

Suggested reading.

Ford, T. M., and Joiner, G. N.: Pneumonia in a rat associated with Corynebacterium pseudotuberculosis: a case report and literature survey. Lab. Anim. Care 18: 220-223, 1968.

Kohn, D. F., and Barthold, S. W.: Biology and Diseases of Rats. In: Laboratory Animal Medicine, Fox, J. G., Cohen, B. T., Loew, F. M. (eds.). Academic Press, Inc., pp. 100-101, 1984.

Slide 51

History. This 2-year-old male Sprague-Dawley rat was part of a group in an oncogenicity study in which the compound was mixed in the diet. The animal developed a large mass and was euthanatized on the 659th day of the study.

Gross Pathology. There was a 75x85x35-mm ulcerated mass on the left thigh. It contained dark-red and tan-to-red cystic areas that exuded red fluid.

Diagnosis. Subcutis, left thigh (per contributor): Malignant fibrous histiocytoma, Sprague-Dawley rat, rodent.

Contributor's Comment and Conference Note. This tumor has areas of histiocytic and fibrocytic differentiation, areas with a mixture of both cell types, and areas where multinucleated giant cells are present. Malignant fibrous histiocytomas may have areas of necrosis and commonly metastasize. The histogenesis of this neoplasm is controversial. In rodents, the cell of origin has been variously postulated as being resting macrophages, Langerhans cells, hepatic perisinusoidal cells, or some unknown cell type. Interestingly, antigen and enzyme data suggest that the multinucleated giant cell component of the malignant fibrous histiocytoma is unrelated to the adjacent tumor cells and is actually of monocyte/macrophage lineage.

Contributor. Hazelton Laboratories America, Inc., Madison, WI.

Suggested reading. Ward, J. M., Kulwich, B. A., Reznik, G., and Berman, J. J.: Malignant fibrous histiocytoma. Arch. Pathol. Lab. Med. 105: 313-316, 1981.

Slide 52

History. This is tissue from a 16-year-old thoroughbred mare.

Gross Pathology. The right lobe of the liver was markedly smaller than expected.

Diagnosis. 1. Liver, right lobe (per contributor): Hepatocellular loss and stromal condensation, diffuse, severe, thoroughbred, equine. 2. Liver: Hepatitis, portal, subacute, multifocal, minimal.

Contributor's Comment and Conference Note. The equine liver is divided by fissures into four lobes: right, caudate, quadrate, and left.

Atrophy of the right lobe of the liver is a common incidental finding in aged mares that are submitted to the contributor's necropsy service. The cause is unknown. There is no consistent pattern of associated clinical signs or clinicopathologic changes.

Contributor. Parker, Sterling, VA.

Suggested reading. Getty, R.: Sisson and Grossman's The Anatomy of the Domestic Animals, Vol. 1, 5th Ed., W. B. Saunders Co., pp. 492-497, 1975.

Slides 53 & 54

History. The fetus and placenta from a female quarterhorse that aborted at 9 months of gestation were presented for examination.

Gross Pathology and Laboratory Results. The lungs were inflated. The peritoneal cavity was full of clotted blood, the source being a ruptured liver. There was meconium in the pharynx, and multiple ribs were fractured. There were thickened, necrotic areas on the placenta and other areas that were thin and congested. Chlamydia sp was isolated from liver, spleen, and placenta; a Macchiavello stain of liver imprints was positive for chlamydial elementary bodies.

Diagnosis. Placenta: Placentitis, subacute, multifocal, minimal to mild, with intra-epithelial protozoa, quarterhorse, equine.

Contributor's Comment and Conference Note. Placentitis due to Encephalitozoon cuniculi was diagnosed based on the staining reaction of the organisms in the placenta (gram-positive, Giemsa-positive, strong staining with Macchiavello, poor staining with GMS) and on their morphology as revealed by electron microscopy. Organisms were not found in other fetal tissues.

The fetus was alive at delivery as indicated by fully inflated lungs. Actual cause of death was trauma and hemorrhage. Both Chlamydia and Encephalitozoon were present in great numbers, yet placental inflammation and necrosis are remarkably mild. No previous reports of encephalitozoonosis in the equine were found by conference participants.

Contributor. University of Arizona, Tucson, AZ.

Suggested reading. Pakes, S. P., Shadduck, J. A., and Cali, A.: Fine structure of Encephalitozoon cuniculi from rabbits, mice and hamsters. J. Protozool. 22: 481-488, 1975.

Slide 55

History. This is tissue from a 6-year-old thoroughbred stallion that had an 8-month history of unilateral bloody nasal discharge and progressive dyspnea. A large mass was noted in the right nasal and maxillary sinuses on radiographs.

Gross Pathology. A dark-red 6x8x12-cm ovoid mass was attached to the ethmoid bones and rim of the right maxillary sinus. The mass extended into the nasopharynx and maxillary sinus, destroying the posterior portions of the right nasal turbinates.

Diagnosis. Nasal cavity (per contributor): Organizing hematoma, with associated granulomatous inflammation, thoroughbred, equine.

Contributor's Comment and Conference Note. Ethmoid hematomas may be sequelae to chronic inflammation or may arise from mucosa that has angiomatous changes in its capillary networks. The hematomas gradually increase in size, eventually extending into the nasal cavity and nasopharynx.

The lesion consists of a loosely arranged network of fibrous connective tissue and varisized blood vessels between which are (1) aggregates of free erythrocytes and (2) macrophages and multinucleated giant cells (mostly foreign-body type) containing hemosiderin and phagocytized erythrocytes. Many of the connective tissue fibers and blood vessels are calcified. Necrotic foci and clusters of lymphocytes and plasma cells are scattered through the tissue; some sections also contain fragments of necrotic turbinate bone.

Contributor. College of Veterinary Medicine, Oregon State University, Corvallis, OR.

Suggested reading.

Dungworth, D. L.: The respiratory system. In: Pathology of Domestic Animals, Vol. 2, Jubb, K. V. F., Kennedy, P. C., Palmer, N. (eds.). 3rd Ed., Academic Press, Inc., p. 431, 1985,

Etherington, W. G., Vasey, J. R., and Horney, F. D.: Ethmoid hematoma of the equine. Can. Vet. J. 23: 231-234, 1982.

Slide 56

History. This adult female mixed-breed pony received a transfusion of whole blood from a horse with a field case of Potomac horse fever. The pony developed fever, anorexia, and diarrhea and was killed 4 days after transfusion.

Gross Pathology. The contents of the cecum and colon were normal in volume but excessively fluid. The mucosa had poorly demarcated areas of hyperemia, ulceration, and petechiation.

Diagnosis. Colon: Colitis, subacute, diffuse, moderate, with multifocal crypt abscesses, mixed-breed pony, equine.

Contributor's Comment and Conference Note. Potomac horse fever, or equine monocytic ehrlichiosis, is an infectious but not contagious disease; it occurs seasonally between June and late September and can be transmitted by transfusion of whole blood from infected horses. The causative agent, Ehrlichia risticii, is reportedly found within the glandular epithelial cells of the intestinal mucosa and within mast cells and macrophages in the lamina propria.

The clinical findings of diarrhea, leukopenia, and shock are suggestive of endotoxemia or salmonellosis. However, gross lesions even in severe cases are absent or are limited to a few vague areas of hyperemia in the colon and cecum. The absence of lesions in the face of such severe clinical signs is the key to the diagnosis of Potomac horse fever. Microscopic evidence of inflammation is minimal or absent. The inflammation in this case is more extensive than in many cases of Potomac fever and is probably due to concurrent infection with small strongyles.

E risticii is antigenically distinct from E equi. Although both organisms infect horses, E equi differs in that it has a tropism for the cytoplasm of neutrophils and eosinophils and it causes clinical signs that include limb edema, icterus, ataxia, fever, depression, and anorexia.

Contributor. Virginia-Maryland Regional College of Veterinary Medicine, Virginia Tech, Blacksburg, VA.

Suggested reading. Cordes, D. O., Perry, B. D., Rikihisa, Y., and Chickering, W. R.: Enterocolitis caused by Ehrlichia sp in the horse (Potomac horse fever). Vet. Pathol. 23: 471-477, 1986.

Slide 57

History. This tissue is from one of six goslings that became listless and inappetant, developed diarrhea, and died at about 3 to 4 weeks of age.

Gross Pathology. The gosling was emaciated. The intestinal lumen was filled with parasites, mucus, and some hemorrhage.

Diagnosis. Large intestine: Trematodes, intraluminal, multiple, goose, avian.

Contributor's Comment and Conference Note. The trematodes in this gosling are most likely either Echinostoma revolutum or E paraulum. E revolutum is found in the rectum and cecum of ducks, geese, other aquatic and gallinaceous birds, and man, while E paraulum has been identified in the small intestine of ducks, pigeons, and man. In the present case, the flukes were found throughout the small intestine but were not seen in the rectum or cecum of the gosling.

However, basing identification of parasites on their location at necropsy is not always reliable, since many intestinal helminths detach and migrate within the digestive tract following death of the host.

The life cycles of echinostomes typically require two intermediate hosts; the first is a snail and the second is usually a snail, clam, or fish. The definitive host is infected by consuming the appropriate intermediate host. Infected birds may be asymptomatic or show inappetance, thirst, diarrhea, lassitude, and progressive weakness.

Contributor. USAMRIID, Fort Detrick, MD.

Suggested reading. Soulsby, E. J. L.: Helminths, Arthropods, and Protozoa of Domesticated Animals. 7th Ed., Lea & Febiger, Philadelphia, pp. 55-61, 1982.

Slide 58

History. This is tissue from a 10-year-old castrated West Highland white terrier that developed ascites and anorexia.

Gross Pathology. The liver parenchyma was converted to nodules that ranged up to 2 cm in diameter.

Diagnosis. 1. Liver: Cirrhosis, active, moderate, with hepatocellular vacuolar change, West Highland white terrier, canine. 2. Liver: Hematopoiesis, extramedullary, multifocal, moderate.

Contributor's Comment and Conference Note. The atomic absorption analysis of the cirrhotic liver revealed a copper concentration of 1550 parts per million on a dry weight basis (normal is less than 400 ppm of dry weight).

Hepatocellular accumulation of copper has been reported in several breeds of dogs: the West Highland white terrier, the Bedlington terrier, and the Doberman pinscher. The normal excretion of copper into

bile is altered in these dogs so that copper is stored in lysosomes within hepatocytes, eventually reaching toxic levels. Upon its release into the cytosol, copper generates free radical formation and, ultimately, causes necrosis of centrilobular hepatocytes. This results in histopathologic changes that include hepatitis, hepatic necrosis, and cirrhosis.

Contributor. College of Veterinary Medicine, University of Missouri, Columbia, MO.

Suggested reading. Thornburg, L. P., Shaw, D., Dolan, M., Raisbeck, M., Crawford, S., Dennis, G. L., and Olwin, D. B.: Hereditary copper toxicosis in West Highland white terriers. Vet. Pathol. 23:148-154, 1986.

Slide 59

History. This 6-year-old female springer spaniel dog presented with polydipsia, polyuria, weight loss, debilitation, and edema of the ventrum and extremities. Laboratory results indicated hypoproteinemia, hypoalbuminemia, hypercholesterolemia, hypocalcemia, and proteinuria.

Gross Pathology. Fixed tissues were submitted, including both kidneys and the entire heart/lung uninflated block. Kidneys were pale, with a waxy appearing, irregular cortical surface and a firm, rubbery consistency.

Diagnosis. 1. Kidney: Amyloidosis, glomerular, segmental to diffuse, generalized, severe, with tubular proteinosis and multifocal medullary interstitial amyloidosis, springer spaniel, canine. 2. Kidney: Necrosis, tubular, multifocal, mild. 3. Kidney: Nephritis, interstitial, lymphoplasmacytic, multifocal, minimal to mild. 4. Lung, vasculature: Thrombi, organizing, multiple. 5. Lung: Mineralization, interstitial, multifocal, mild.

Contributor's Comment and Conference Note. The palely eosinophilic, acellular, predominantly pericapillary glomerular deposits demonstrated very weak apple-green birefringence upon polarization after Congo red staining and did not stain positive with PAS. The gross appearance of the kidneys, documentation of the nephrotic syndrome, and microscopic appearance are all consistent with renal amyloidosis.

A massive pulmonary thrombus occluded the entire main pulmonary artery segment. Although failure to infuse the lungs post mortem made assessment difficult, the severe alveolar collapse does not appear to be the result of ischemia, despite the severity of the thrombus

present. This re-emphasizes the fact that, in the face of normal cardiac function and bronchial artery perfusion, pulmonary thrombi or emboli will generally not create infarction or clinical signs.

Contributor. Department of Laboratory Animal Resources, University of Pittsburgh, PA.

Suggested reading.

DiBartola, S. P., and Chew, D. J.: Glomerular diseases in the dog and cat. In: Current Veterinary Therapy IX, Kirk, R. W. (ed.). W. B. Saunders Co., pp. 1133-1137, 1986.

Maxie, M. G.: The urinary system. In: Pathology of Domestic Animals, Jubb, K. V. F., Kennedy, P. C., Palmer, N. (eds.). Vol 2, 3rd Ed., Academic Press Inc., pp. 368-369, 1985.

Slide 60

History. This 5-month-old male cynomolgus monkey (Macaca fascicularis) had facial deformation and proptosis of the left eye as a result of a peri- and retro-orbital mass.

Gross Pathology. Grossly, the mass extended ventromedially through the lacrimal, ethmoid, maxillary and frontal bones and the soft tissue behind the right eye and caudodorsally through the frontal bone into the meninges and parenchyma of the frontal cerebral lobe.

Diagnosis. Peri- and retro-bulbar mass: Lymphosarcoma, Macaca fascicularis, primate.

Contributor's Comment and Conference Note. According to the contributor, this neoplasm was similar clinically to those seen in children with Burkitt's lymphoma. However, Burkitt's lymphoma is an undifferentiated lymphoma of B-cell origin and the cells have no morphologic evidence of "maturation" toward lymphocytes or histiocytes. In contrast, the microscopic features of the neoplastic cells in this case are predominantly plasmacytoid.

Burkitt's lymphoma is linked to Epstein-Barr virus infection. In nonhuman primates, lymphosarcomas have been associated with simian retrovirus infections, persistent immunological stimulation in malaria infection, Herpes saimiri infection in marmosets and owl monkeys, and Herpes simplex infection in owl monkeys.

Contributor. Bowman Gray School of Medicine, Winston-Salem, NC.

Suggested reading.

Chalifoux, L. V., King, N. V., Daniel, M. D., Kannagi, M., Desrosiers,
R. C., Sehgal, P. K., Waldron, L. M., Hunt, R. D., and Letvin, N. L.: Lymphoproliferative syndrome in an immunodeficient rhesus monkey naturally infected with an HTLV-III-like virus (STLV-III). Lab. Invest. 55: 43-50, 1986.

Robbins, S. L., Cotran, R. S., and Kumar, V.: Pathologic Basis of Disease, 3rd Ed. , W. B. Saunders Co., pp. 657-674, 1984.

Slide 61

History. This tissue is from one of six 12-week-old turkeys inoculated intratracheally with an infectious agent and necropsied 5 days later. The birds were noted to be lethargic just before necropsy.

Gross Pathology and Laboratory Results. The spleen was markedly enlarged and a mottled purple and tan. The pericardium was moderately thickened and opaque with numerous adhesions to the epicardium. The epicardium was covered with a thick, weblike coating of fibrin. The abdominal air sacs were translucent and slightly thickened. Chlamydia psittaci (Texas turkey-3 strain) was isolated from pericardial tissue; this strain is highly virulent for turkeys.

Diagnosis. Heart: Epicarditis, fibrinous, subacute, diffuse, severe, with multifocal, granulomatous, subepicardial myocarditis, turkey, avian.

Contributor's Comment and Conference Note. The gross lesions are suggestive of chlamydiosis, but infection by gram-negative bacteria such as E. coli and Salmonella spp should be considered in a differential diagnosis. The histopathologic changes are consistent with chlamydial infection; chlamydiae were detected with an immunoperoxidase technique and were seen with difficulty in Gimenez-stained sections. We have found this strain to be routinely difficult to detect in paraffin sections stained with commonly used polychromatic stains.

The typical gross lesions in chlamydiosis include a fibrinous or caseofibrinous pericarditis, perihepatitis, peritonitis, and air sacculitis, as well as splenomegaly. Myocarditis is also a common finding, occurring as an apparent extension from the pericarditis, as in this case. The chlamydial organisms fill the cytoplasm of the mononuclear cells that accompany the fibrinous exudation.

Contributor. National Animal Disease Center, Ames, IA.

Suggested reading. Page, L. A., and Grives, J. E.: Avian chlamydiosis (ornithosis). In: Diseases of Poultry, Hofstad, M. S., Barnes, H. J., Calnek, B. W., Reid, W. M., and Yoder, H. W., Jr. (eds.). 8th Ed., Iowa State University Press, Ames, Iowa, pp. 283-308, 1984.

Slide 62

History. These tissues are from an adult male wild-caught ornate horned frog (Ceratophrys ornata).

Gross Pathology. A raised 3x4-mm verrucous dermal mass was on the margin of the maxilla. Several similar masses were on the snout, and one was over the dorsal thoracic region. Numerous 1-mm-diameter whitish nodules were distributed throughout the liver and lungs, with fewer nodules in the spleen and kidneys.

Diagnoses. 1. Skin: Dermatitis, granulomatous, diffuse, severe, with multiple necrogranulomas and pigmented fungal elements, ornate horned frog (Ceratophrys ornata), amphibian. 2. Liver: Necrogranulomas, multiple, with pigmented fungal elements.

Contributor's Comment and Conference Note. Chromoblastomycosis or chromomycosis is a disease of amphibians and man that is rarely reported in other mammalian species. It is caused by dematiaceous, dimorphic, saprophytic fungi of the genera Fonsecaea, Phialophora, Cladosporium, Rhinocladiella, and Scolecosbasidium. These agents grow on the walls of housing tanks, in soil or in organic matter; they gain access to the host through traumatized skin. In frogs and toads, chromoblastomycosis is a systemic mycotic infection, with granulomas in the skin, liver, spleen, kidneys, lungs, and other viscera.

Contributor. National Zoological Park, Washington, DC.

Suggested reading.

Anver, M. R., and Pond, C. L.: Biology and diseases of amphibians. In: Laboratory Animal Medicine, Fox, J. G., Cohen, B. J., and Loew, F. M. (eds.). Academic Press, Inc., pp. 440-441, 1984.

Rush, H. G., Anver, M. R., and Beneke, E. S.: Systemic chromomycosis in Rana pipiens. Lab. Anim. Sci. 24: 646-655, 1974.

Slide 63

History. Several birds housed in a single exhibit became acutely ill and died. These tissues are from an adult female Nicobar pigeon (Caloenas nicobarica nicobarica).

Gross Pathology. Gross lesions included thickening or clouding of pleurae and air sacs; congestion with occasional mottling (dull pink and red) of lungs, livers, and kidneys; and discrete multifocal thickenings of intestinal walls.

Diagnoses. 1. Spleen: Splenitis, necrotizing, subacute, diffuse, moderate, with granulomatous capsulitis and intracellar and extracellular protozoa, Nicobar pigeon (Caloenas nicobarica nicobarica), avian. 2. Liver: Hepatitis, perivascular, granulomatous, multifocal, moderate, with intra- and extracellular protozoa. 3. Liver: Hemosiderosis, multifocal, moderate.

Contributor's Comment and Conference Note. This outbreak of toxoplasmosis involved ten birds of five different species, all housed in a single cage. Microscopically, Toxoplasma tachyzoites were numerous in macrophages and other phagocytes and as free forms in many organs, including ovary, brain, lung, air sac, kidney, liver, spleen, and the lamina propria, muscularis, and serosa of the intestines. A definitive diagnosis was made with routine histology, special histochemical stains, transmission electron microscopy, and an immunoperoxidase procedure. In addition to the lesions in the liver and spleen, several conference participants identified Toxoplasma organisms and areas of necrosis in sections of proventriculus.

Contributor. USAFSAM, Brooks AFB, TX.

Suggested reading. Hubbard, G., Witt, W., Healy, M., and Schmidt, R.: An outbreak of toxoplasmosis in zoo birds. Vet. Pathol. 23: 639-641, 1986.

Slide 64

History. This 1-year-old male cotton-top tamarin (Saguinus oedipus) had diarrhea in which the stools contained mucus and fresh blood. The diarrhea was accompanied by anorexia, lethargy, and weakness of two days' duration. Treatment was ineffective, and the animal developed neurologic signs and died.

Gross Pathology. The animal was presented emaciated and with fecal soiling of the haircoat. In the colon was multifocal erythema/hemorrhage and scant tan feces that was soft to fluid. Visceral lymph nodes were enlarged, there was extensive peripancreatic edema, and small amounts of clear fluid were in the pleural and peritoneal cavities.

Diagnosis. Colon: Colitis, subacute to chronic, diffuse, moderate, with multifocal crypt microherniation, cotton-top tamarin (Saguinus oedipus), primate.

Contributor's Comment and Conference Note. A high incidence of colitis, frequently unassociated with a viral, bacterial, or parasitic etiology, has been reported in cotton-top tamarins. The disease can occur in animals of any age, but it is frequently seen in animals less than a year old. Microscopically, early lesions are characterized by multifocal aggregates of neutrophils in the lamina propria and/or occasional intraepithelial neutrophils. More severe lesions have extensive neutrophilic infiltrates in the lamina propria, the mucosal epithelium, and sometimes the submucosa, as well as multiple crypt abscesses. Chronicity is assessed by surface and crypt irregularity as well as by branching of crypts and crypt loss. The disease is of interest to medical researchers because of its association with the development of colonic adenocarcinoma and because there is a similar association between ulcerative colitis and colonic adenocarcinoma in humans.

Contributor. New England Regional Primate Research Center, Southborough, MA.

Suggested reading.

Chalifoux, L. V., and Bronson, R. T.: Colonic adenocarcinoma associated with chronic colitis in cotton top marmosets, Saguinus oedipus. Gastroenterol. 80: 942-946, 1981.

Richter, C. B., Lehner, N. D. M., and Henrickson, R. V.: Primates. In: Laboratory Animal Medicine, Fox, JG, Cohen, BJ, Loew, FM (eds.). Academic Press, Inc., PP. 376-377, 1984.

Slide 65

History. This is tissue from a wild-caught 7-year-old female cynomolgus monkey (Macaca fascicularis).

Gross Pathology. There were multifocal 1- to 3-mm-diameter tan, raised areas on the surface of the liver.

Diagnosis. Liver: Granulomas, eosinophilic, multiple, with protozoal merocysts and mild, diffuse, chronic, eosinophilic, portal hepatitis, cynomolgus monkey (Macaca fascicularis), primate.

Contributor's Comment and Conference Note. The multifocal granulomas contain protozoal forms consistent with merocysts of Hepatocystis sp. Like the malarial parasites of the Plasmodium genus, to which they are closely related, Hepatocystis spp have life cycles that include several developmental stages. Sporogony occurs in the intermediate hosts, which are biting insects. The vector introduces sporozoites while feeding on the definitive hosts, which are certain old world primates. Schizogony occurs in hepatocytes; the organisms divide, forming parasitic cysts that enlarge and coalesce over a 1- to 2-month developmental period, forming merocysts that are up to 2 to 3 mm in size. Rupture of the merocysts frees the merozoites, and they invade erythrocytes to develop into gametocytes. Unlike the plasmodia, intraerythrocytic schizogony does not occur with Hepatocystis.

Contributor. Hazleton Laboratories, Vienna, VA.

Suggested reading. Ryan, M. J., Cousins, O. B., and Bhandari, J. C.: Diagnostic exercise: hepatic granulomas in a cynomolgus monkey. Lab. Anim. Sci. 36: 56-58, 1986.

Slides 66 & 67

History. The submitted cecal biopsy specimen was obtained from a 10-month-old female boxer dog with a history of a chronic and often bloody diarrhea.

Gross Pathology. The wall of the cecum was uniformly thickened with multiple 1- to 3 mm diameter pitted foci in the mucosa.

Diagnosis. Large intestine: Colitis, histiocytic, diffuse, severe, with multifocal mucosal erosions, boxer, canine.

Contributor's Comment and Conference Note. Histiocytic ulcerative colitis has been primarily described in the boxer and in the related French bulldog. Affected animals have a chronic large bowel diarrhea that produces stools containing mucus and blood, and they are usually under 2 years of age. The disease has been compared to several human enteric diseases, including Whipple's disease.

The prevalence of histiocytic ulcerative colitis in certain breeds suggests a genetic predisposition. A defect in lysosomal function,

resulting in accumulation of partially digested phospholipid membranes within macrophages, is a proposed pathogenesis. However, as yet unidentified environmental or infectious causes may also be contributory and might account for the occurrence of the disease in certain kennels.

Contributor. C. E. Kord Animal Disease Laboratory, Nashville, TN.

Suggested reading.

Barker, I. K., and Van Dreumel, A. A.: The alimentary system. In: Pathology of Domestic Animals, Jubb, K. V. F., Kennedy, P. C., Palmer, N. (eds.). Vol 2, 3rd Ed., Academic Press, Inc., 1985, p. 82.

Van Kruiningen, H. J., Montali, R. J., Strandberg, J. D., and Kirk, R. W.: A granulomatous colitis of dogs with histologic resemblance to Whipple's disease. Path. Vet. 2: 521-544, 1965.

Slide 68

History. This 13-year-old male castrated domestic shorthair cat had a 3-month history of vomiting and diarrhea, and he became emaciated and dehydrated terminally.

Gross Pathology. Marked splenomegaly, hepatomegaly, and abdominal lymphadenopathy were evident. Both the splenic and hepatic surfaces were mottled red and white, with many irregular, 2-mm to 1-cm white foci evident in the liver. Femoral bone marrow was uniformly pink and cellular.

Diagnoses. 1. Liver and spleen: Mast cell tumor, domestic shorthair, feline. 2. Liver: Lymphosarcoma.

Contributor's Comment and Conference Note. Lymphosarcoma is the most common neoplasm of cats, with mammary adenocarcinoma and mast cell tumor ranking second and third, respectively. The presence of two of these neoplastic cell populations within the same organ is unusual but has been reported previously.

Contributor. College of Veterinary Medicine, University of Minnesota, St. Paul, MN.

Suggested reading.

Carpenter, J. L., Andrews, L. K., and Holzworth, J.: Tumors and tumor-like lesions. In: Diseases of the Cat, Medicine and Surgery, Holzworth, J. (ed.). Vol 1, W. B. Saunders Co., pp. 569-579, 1987.

Slide 69

History. A 2-year-old crossbred-Jersey steer was dosed with toxic plant material collected in a camp where 10 out of a herd of 91 cattle had died. Clinical signs included ruminal stasis, icterus, and photosensitivity; black and soft feces were passed on posttreatment day 4.

Gross Pathology. The liver was moderately swollen, friable, and yellowish brown to orange with a distinct lobular pattern. The gallbladder was edematous, contained pale green bile, and had scattered mucosal hemorrhages. There was marked, bilateral perirenal edema; renal cortices were petechiated and bulged at the cut surface. The contents of the abomasum and of the small and large intestines were dark brown to black and watery to pastelike. In addition, edema of the intestinal wall was evident.

Diagnoses. 1. Liver, hepatocytes: Swelling and vacuolar degeneration, diffuse, mild to moderate, with widespread individual cell necrosis, Jersey crossbreed, bovine. 2. Kidney: Necrosis, tubular, diffuse, severe, with regeneration.

Contributor's Diagnosis and Comment. The histopathological changes in the liver are compatible with those described for Lantana camara poisoning. Individual areas of hepatocellular necrosis and multiple small foci of coagulative necrosis are randomly distributed throughout the parenchyma, sometimes infiltrated by a few neutrophils and macrophages. There was also moderate to severe nephrosis; azotemia was present. The black diarrheal feces and dark intestinal contents are features consistent with the acute gastrointestinal manifestation of Lantana poisoning in cattle. Severe impairment of ruminal and intestinal function in Lantana poisoning may hamper the recycling of urea nitrogen and cause uremia, indicated by the presence of perirenal edema, edema of the intestinal wall, and enterorrhagia.

Two toxic principles have been isolated from Lantana camara: lantadene A and B. These triterpene acids cause liver injury by damaging bile canalicular membranes. The resulting intrahepatic cholestasis causes bilirubin retention, phylloerythrin retention, and ruminal stasis. Renal damage can also occur, but whether it is related to the toxins themselves or to the hyperbilirubinemia is not known.

Contributor. Veterinary Research Institute, Onderstepoort, South Africa.

Suggested reading.

Pass, M. A.: Current ideas on the pathophysiology and treatment of Lantana poisoning of ruminants. Aust. Vet. J. 63: 169-171, 1986.

Seawright, A. A., Allen, J. G.: Pathology of the liver and kidney in Lantana poisoning of cattle. Aust. Vet. J. 48: 323-331, 1972.

Slide 70

History. This 5-year-old male red point Siamese cat was admitted to a veterinary hospital in a paretic and collapsed state. Coma ensued, and death occurred later the same day.

Gross Pathology. Cut surfaces of the formalin-fixed brain revealed bilaterally symmetrical, red foci in the dorsolateral thalamus, dorsal colliculi, and medulla oblongata.

Diagnosis. Medulla oblongata: Polioencephalomalacia, hemorrhagic, bilaterally symmetrical, moderate to severe, Siamese, feline.

Contributor's Comment and Conference Note. The nature and the distinctive distribution of the lesion, together with the clinical history, are compatible with thiamine deficiency encephalopathy as described in cats and other species. Specific areas of the gray matter of the brain are selectively vulnerable to developing the lesions of thiamine deficiency, but the areas vary somewhat between species. The periventricular gray matter of the inferior or caudal colliculi is most consistently affected in cats, but the extent of the lesions is variable. The lateral vestibular nuclei are most commonly affected in rats, while the caudal colliculi in mink, foxes, and dogs and the mammillary bodies in man are susceptible sites. Subsequent inquiry into the diet in this case disclosed no obvious reason for thiamine deficiency; the cat had not eaten raw fish.

Contributor. University of Liverpool, Liverpool, UK.

Suggested reading.

Read, D. H., and Harrington, D. D.: Experimentally induced thiamine deficiency in Beagle dogs: Pathologic changes of the central nervous system. Am. J. Vet. Res. 47: 2281-2299, 1986.

Sullivan, N. D.: The nervous system. In: Pathology of Domestic Animals, Vol 1, Jubb, K. V. F., Kennedy, P. C., Palmer, N. (eds.). 3rd Ed., Academic Press, Inc., 1985, pp. 256-258.

Slide 71

History. This 8-year-old spayed female Doberman pinscher canine had a chronic cough and radiographic evidence of multiple lung masses. An eosinophilic purulent exudate was obtained on transtracheal wash. The CBC was characterized by a marked eosinophilia (5000/ul). A modified Knott's technique and capillary screening test were negative. ELISA for adult heartworm antigen and IFA for anti-microfilarial antibody were positive.

Gross Pathology. The lungs contained diffuse multiple nodules. A 10- to 12-cm mass was present in the left caudal lung lobe. Five adult Dirofilaria immitis were present in the right ventricle.

Diagnosis. Lung: Pneumonia, granulomatous, eosinophilic, chronic, focally extensive, severe, Doberman pinscher, canine.

Contributor's Comment and Conference Note. Eosinophilic granulomatous lung lesions in the dog appear to have a high association with heartworm disease. Although the numbers of reported cases are few, more than half had radiographic or post mortem evidence of heartworm disease. A specific cause and effect relationship has not been established, however. The eosinophilic granulomatous pneumonias are characterized by poorly circumscribed, nonencapsulated granulomas predominantly composed of macrophages and eosinophils bordered by fibroplasia. Adjacent lung parenchyma often contains type II cell hyperplasia and smooth muscle hypertrophy of the alveolar ducts and bronchioles.

Contributor. College of Veterinary Medicine, University of Georgia, Athens, GA.

Suggested reading. Neer, T. M., Waldron, D. R., and Miller, R. I.: Eosinophilic pulmonary granulomatosis in two dogs and literature review. J. Am. Anim. Hosp. Assoc. 22: 593-599, 1986.

Slide 72

History. This adult female New Zealand white rabbit was extremely thin and not eating. On physical examination an abdominal mass was palpated.

Gross Pathology. The uterine horns were thickened and contained hemorrhagic, nodular masses. There were also multiple nodular masses in the mesentery, on the liver capsule, and in the lungs.

Diagnosis. Uterus (per contributor): Adenocarcinoma, poorly differentiated, with pulmonary metastases, New Zealand white rabbit, lagomorph.

Contributor's Comment and Conference Note. Uterine adenocarcinoma is the most frequently observed neoplasm in aging female rabbits. This neoplasm is commonly multicentric, with irregularly spaced masses located in both horns of the uterus. The mechanism by which these tumors are induced is not understood; multiple endocrine imbalances may be responsible for tumor development.

Contributor. Uniformed Services University of the Health Sciences, Bethesda, MD.

Suggested reading. Weisbroth, S. H.: Neoplastic diseases. In: The Biology of the Laboratory Rabbit, Weisbroth, S. H., Flatt, R. E., Kraus, A. L. (eds.). Academic Press, 1974, pp. 336-339.

Slide 73

History. A 5-year-old male Doberman pinscher had a 1-1/2-month illness that was terminated by euthanasia. Clinical signs included dripping of blood from the penis, dyspnea, vomiting, nasal congestion and exudation, dropped jaw, atrophy of mastication muscles, rear limb weakness, ataxia, bilateral Horner's syndrome, and weight loss.

Gross Pathology. Dull-white nodules were in both trigeminal ganglia and trigeminal nerves, in all lung lobes (in a peribronchial pattern), and in both renal cortices. There was hepatosplenomegaly.

Diagnoses. 1. Bone marrow, liver, lung and ganglion: Myeloproliferative neoplasia, Doberman pinscher, canine. 2. Liver, hepatocytes: Vacuolar change, diffuse, moderate.

Contributor's Comment and Conference Note. This dog had disseminated myelomonocytic neoplasia involving many nerves (most notably the trigeminal nerves and ganglia), lungs, kidneys, liver, nasal turbinates, adrenals, choroid plexus of the fourth ventricle, and some lymph nodes; there were small neoplastic foci in the bone marrow.

Although a specific diagnosis of myelomonocytic neoplasia is not possible in this case based on the appearance of the cells with light microscopy, electron-microscopic findings were consistent with myelomonocytic neoplasia. Myelomonocytic neoplasia arises from a neoplastic clone of undifferentiated stem cells with both myelogenous

and monocytic characteristics. Since the granulocytic and monocytic series have a common stem cell origin, a maturation arrest with clonal proliferation is presumed to be the origin of the neoplastic process.

Contributor. Angell Memorial Animal Hospital, Boston, MA.

Suggested reading.

Carpenter, J. L., King, N. W., Jr., and Abrams, K. L.: Bilateral trigeminal nerve paralysis and Horner's syndrome associated with myelomonocytic neoplasia in a dog. J. Am. Vet. Med. Assoc. 191: 1594-1596, 1987.

Christopher, M. M., Metz, A. L., Klausner, J., Polzin, D., and Hayden, D. W.: Acute myelomonocytic leukemia with neurologic manifestations in the dog. Vet. Pathol. 23: 140-147, 1986.

Slide 74

History. This 2-1/2-year-old spayed female springer spaniel had a 1-year history of progressive neurological deterioration characterized by severe ataxia, posterior proprioceptive deficits, and apparent visual problems. The dog remained alert and responsive with no evidence of behavioral changes.

Gross Pathology. There was a mild thickening of the optic and vagus nerves as well as of those of the brachial plexus.

Diagnoses. 1. Spinal cord, neuronal perikaryons and neuroglial cells: Cytoplasmic swelling and vacuolation, diffuse, severe, springer spaniel, canine. 2. Spinal cord, spinal nerve roots, and meninges: Vacuolated mononuclear cell aggregates, perivascular, multifocal, severe.

Contributor's Comment and Conference Note.

Alpha-L-fucosidosis, one of the glycoproteinoses, is a familial condition in the springer spaniel and is associated with a decrease or absence of the enzyme alpha-L-fucosidase (a deficiency of this enzyme was demonstrated in this case). Partially degraded fucose-containing glycoproteins accumulate within and distend lysosomes of neurons and glial cells, with eventual cellular dysfunction and death. Similar vacuolar changes occur in renal tubular epithelium, adrenal cortical cells, pancreatic acinar and ductular epithelium, biliary epithelium, sinus histiocytes of lymph nodes, reticuloendothelial cells of the spleen, and peripheral lymphocytes.

Contributor. University of Pittsburgh, Pittsburgh, PA.

Suggested reading. Kelly, W. R., Clague, A. E., Barns, R. J., Bate, M. J., and MacKay, B. M.: Canine alpha-L-fucosidosis: A storage disease of springer spaniels. Acta Neuropathol. (Berl.) 60: 9-13, 1983.

Slide 75

History. A 4-month-old male ferret (Mustela putorius furo) was presented with acute onset of severe diarrhea, tremors, and rectal prolapse. Despite treatment with erythromycin, it died the following day.

Gross Pathology. There was rectal prolapse and soft brown ingesta in the bowel.

Diagnosis. Colon: Colitis, proliferative, acute to subacute, diffuse, moderate, with multifocal crypt abscesses, ferret (Mustela putorius), mustelid.

Contributor's Comment and Conference Note. Microscopic examination revealed mild epithelial proliferation in the mucosa and focal penetration of the mucosal glands through the muscularis mucosa into the submucosa, with an accompanying mixed inflammatory cell infiltrate. Warthin-Starry-stained sections of the colon revealed numerous organisms in the apical portion of epithelial cells compatible with Campylobacter sp.

Campylobacter spp are an important cause of enterocolitis in many animal species, including man. The disease in the ferret closely mimics the human condition, but important differences in the ferret include the proliferative nature of the mucosal lesions and the general restriction of disease to the colon.

Contributor. United States Army Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, MD.

Suggested reading.

Fox, J. G., Ackerman, J. I., Taylor, N., Claps, M., and Murphy, J. C.: Campylobacter jejuni infection in the ferret: An animal model of human campylobacteriosis. Am. J. Vet. Res. 48: 85-90, 1987.

Fox, J. G., Murphy, J. C., Ackerman, J. I., Prostak, K. S., Gallagher,
C. A., and Rambow, V. J.: Proliferative colitis in ferrets. Am. J. Vet. Res. 43: 858-864, 1982.

Slide 76

History. This 9-year-old male American saddlebred equine had a head tilt and was circling to the right. He appeared to be blind in the left eye, would walk into walls, and was hyperesthetic. Signs persisted for 7 days before euthanasia.

Gross Pathology. Kidneys were bilaterally enlarged and contained white, firm nodules that bulged from the surface and replaced approximately two-thirds of the cortex and medulla.

Diagnosis. Kidney: Nephritis, granulomatous and fibrosing, diffuse, severe, with larval and adult nematodes, American saddlebreed, equine.

Contributor's Comment and Conference Note. This animal had severe, bilateral, verminous nephritis caused by Micronema deletrix infection. Rhabditid nematodes compatible with Micronema sp were numerous within dilated renal tubules and in the interstitium. In addition, smaller numbers of parasites were present adjacent to small blood vessels in the leptomeninges and gray matter of the cerebrum. Micronema spp are free-living nematodes usually found in manure, soil, and decaying humans but can rarely infect horses. The mechanism by which these parasites migrate to and invade the kidneys has not been determined; but the presence of large numbers of adults in the renal parenchyma, often within tubules, suggests a mechanism for voiding the eggs from the infected host.

Contributor. University of Kentucky, Lexington, Kentucky.

Suggested reading.

Alstad, A. D., and Berg, I. E.: Disseminated Micronema deletrix infection in the horse. J. Am. Vet. Med. Assoc. 174: 264-266, 1979.

Ferris, D. H., Levine, N. D., and Beamer, P. D.: Micronema deletrix in equine brain. Am. J. Vet. Res. 33: 33-38, 1972.

Slide 77

History. This 8-year-old female Chihuahua dog presented with a distended abdomen.

Gross Pathology. A large, ovoid, cystic mass involved the left ovary and kidney and was attached to the uterine horn. Multiple metastatic lesions were in the spleen, liver, and visceral lymph nodes.

Diagnosis. Ovary: Carcinoma, poorly differentiated, Chihuahua, canine.

Contributor's Comment and Conference Note. Conference attendees were not in agreement on the most appropriate diagnosis in this case. There was variation between the sections examined by participants, with multiple histologic patterns present. Regardless of cellular arrangement, however, clusters of cells were cytokeratin positive and had the general morphologic appearance of epithelial cells. The diagnosis of poorly differentiated ovarian carcinoma was made, based on these features and on consultation with the Department of Gynecologic and Breast Pathology at the AFIP.

It should be noted that the contributor's diagnosis in this case was ovarian Sertoli-Leydig cell tumor with a retiform pattern. The contributor cited a recent study of 71 ovarian tumors in dogs, in which 17% of the neoplasms were found to be Sertoli-Leydig cell tumors.

Contributor. Animal Medical Center, New York, NY.

Suggested reading.

Nielsen, S. W., Misdorp, W., and McEntee, K.: XV. Tumors of the ovary. Bull. W. H. O. 53: 203-215, 1976.

Patnaik, A. K, and Greenlee, P. G.: Canine ovarian neoplasms: A clinicopathologic study of 71 cases, including histology of 12 granulosa cell tumors. Vet. Pathol. 24: 509-514, 1987.

Slide 78

History. This 18-year-old female lion-tailed macaque (Macaca silenus) presented with a poor appetite and lethargy of 1 to 2 weeks' duration. Exploratory laparotomy found a 6x5x1-cm abdominal mass. The uterus and ovaries could not be visualized, there were extensive omental adhesions, and the abdomen contained 300 ml of blood-tinged fluid. The mass was removed and was submitted for histologic examination.

Gross Pathology. The mass measured 6 x 5 x 1 cm. On cross-section it was uniformly whitish-yellow with a firm texture.

Diagnosis. Adipose and connective tissue, abdominal cavity: Endometriosis, lion-tailed macaque (Macaca silenus), primate.

Contributor's Comment and Conference Note. Endometriosis has been reported in several species of old world primates but has not

previously been reported in a lion-tailed macaque. In the present case, plaques of endometriosis were disseminated over the serosa of the uterus, bladder, and ovaries and in the omentum.

The biological behavior of endometriosis is similar to neoplasia because it can spread in a cancer-like manner within the abdomen. However, unlike a metastatic neoplasm, it is histologically benign and contains both well-differentiated uterine epithelium and the characteristic uterine stroma. In some sections examined by participants, it was not apparent whether the sections were of uterus or from a plaque of endometriosis embedded on a serosal surface; thus, some favored a diagnosis of adenomyosis over endometriosis.

Contributor. University of Washington, Seattle, WA.

Suggested reading. Fanton, J. W., Hubbard, G. B., and Wood, D. H.: Endometriosis: Clinical and pathologic findings in 70 rhesus monkeys. Am. J. Vet. Res. 47: 1537-1541, 1986.

Slide 79

History. This is tissue from a 16-month-old female BALB/cAnNCr mouse.

Gross Pathology. There was reddish fluid in the thoracic cavity. The spleen weighed 290 mg.

Diagnosis. Spleen: Lymphoma, follicular center cell, BALB/cAnNCr mouse, rodent.

Contributor's Comment and Conference Note. The earliest stage of follicular center cell (B-cell) lymphoma can be seen in several splenic follicles. The populations of cells in B-cell and sometimes T-cell areas are more pleomorphic and less basophilic than normal and only a few cleaved cells may be seen. There is variation in morphology among the follicles and white pulp areas, with some white pulp areas (B- and T-cell zones) appearing quite normal. In typical cases, the pleomorphic population enlarges in a nodular or follicular pattern with resulting splenomegaly.

The diagnosis of follicular center cell lymphoma is based on the immunomorphologic classification of murine lymphoid neoplasms developed by Pattengale and Taylor. Classification is based on five major morphologic cell types: follicular center cell, plasma cell, immunoblast, small lymphocyte, and lymphoblast. Follicular center cell lymphomas and plasma cell lymphomas are morphologically distinct B-cell proliferations;

the other types require immunologic confirmation and are less distinct morphologically.

Contributor. National Cancer Institute, Frederick, MD.

Suggested reading. Pattengale, P. K., and Frith, C. H.: Immunomorphologic classification of spontaneous lymphoid cell neoplasms occurring in female BALB/c mice. J. Nat. Cancer Inst. 70: 169-179, 1983.

Slide 80

History. This is tissue from a 23-year-old human female who was a number IV drug abuser for 6 years. During the last 2 weeks of her life, she experienced chest pain, shortness of breath, fever, chills, and night sweats.

Gross Pathology. The lungs had "slimy" parenchyma on cut surface and were uniformly gray-yellow and consolidated.

Diagnosis. Brain: Gliomesenchymal cell nodules and perivascular cuffs, multifocal, mild, with multinucleated giant cells, human, primate.

Contributor's Comment and Conference Note. This case is an example of AIDS encephalopathy (human HIV infection). In all sections from this case, the lesions are almost entirely restricted to white matter. The focal collections of inflammatory cells include macrophages, multinucleated cells and possible reactive glia. The presence of multinucleated giant cells has been described as the hallmark of AIDS encephalitis, but extensive viral infection can occur without inducing syncytium formation. Based on immunohistochemical staining, the multinucleated giant cells are not of neuroepithelial origin; they may represent a cytopathic effect of the virus on lymphoid or histiocytic cells that infiltrate the brain.

This case is of importance to veterinary pathologists because of similarities to and differences from the lentiviral infections of animals. The patient died from Pneumocystis carinii pneumonia.

Contributor. National Cancer Institute, Frederick, MD.

Suggested reading.

Budka, H.: Multinucleated giant cells in brain: A hallmark of the acquired immune deficiency syndrome (AIDS). Acta Neuropathol. (Berl.) 69: 253-258, 1986.

Ward, J. F., O'Leary, T. J., Baskin, G. B., Benveniste, R., Harris, C. A., Nara, P. L., and Rhodes, R. H.: Immunohistochemical localization of human and simian immunodeficiency viral antigens in fixed tissue sections. Am. J. Pathol. 127: 199-205, 1987.

Slide 81

History. This 1-year-old male rhesus monkey (Macaca mulatta) was inoculated with simian immunodeficiency virus (SIV). Inoculation was followed by the development of a recurrent erythematous rash, persistent diarrhea, intestinal trichomoniasis, mucocutaneous candidiasis, progressive weight loss, and decreased proliferative response of peripheral blood lymphocytes to pokeweed mitogen. The animal died 130 days after inoculation.

Gross Pathology. The subdural space contained increased amounts of blood- tinged cerebrospinal fluid, and the brain surface appeared moderately congested.

Diagnosis. Brain: Encephalitis, histiocytic, multifocal and perivascular, mild to moderate, with multinucleated giant cells, rhesus monkey (Macaca mulatta), primate.

Contributor's Comment and Conference Note. The inoculation of rhesus monkeys with SIV causes a disease syndrome remarkably similar to that which occurs with human immunodeficiency virus (HIV) infection. The animals develop a transmissible immunodeficiency syndrome characterized by profound impairment of T-lymphocyte function, resulting in predisposition to opportunistic infections and certain types of neoplasia. Microscopically, the lesions in the brains of SIV-infected rhesus monkeys are distinctive and unlike any previously described neurological lesions in this species, but are virtually identical to those that occur in AIDS encephalopathy.

Contributor. New England Regional Primate Research Center, Southborough, MA.

Suggested reading.

Ringler, D. J., Hunt, R. D., Desrosiers, R. C., Daniel, M. D., Chalifoux, L. V., and King, N. W.: Simian immunodeficiency virus-induced meningoencephalitis: Natural history and retrospective study. Ann. Neurol. 23(Suppl): S101-S107, 1988.

Sharer, L. R., Baskin, G. B., Cho, E. S., Murphey-Corb, M., Blumberg, B. M., and Epstein, L. G.: Comparison of simian

immunodeficiency virus and human immunodeficiency virus encephalitides in the immature host. Ann. Neurol. 23(Suppl): S108-112, 1988.

Slide 82

History. This juvenile male rhesus monkey (Macaca mulatta) became acutely cyanotic and had abdominal distension. The animal did not respond to treatment and subsequently died.

Gross Pathology. The omentum and mesentery contained multifocal to coalescent, firm, white-to-pale-yellow, nodular masses. Similar masses were present on the liver, on both surfaces of the diaphragm, and attached to the parietal pleura. The lungs were completely encased by similar tissue. Lymphadenopathy and splenomegaly were evident.

Diagnosis. Lung and visceral pleura: Fibromatosis, rhesus monkey (Macaca mulatta), primate.

Contributor's Comment and Conference Note. Retroperitoneal fibromatosis has been associated with simian acquired immunodeficiency syndrome (SAIDS) and infection with a type D retrovirus, SRV2. The course is either localized or progressive, with rare invasion of parenchymal organs such as liver, kidney, spleen, and lung. The condition is frequently compared with Kaposi's sarcoma, with which it has certain morphologic similarities, and is similarly associated with an immunodeficiency syndrome.

Contributor. National Institutes of Health, Bethesda, MD.

Suggested reading.

Giddens, W. E., Tsai, C. C., Morton, W. R., Ochs, H. D., Knitter, G. H., and Blakeley, G. A.: Retroperitoneal fibromatosis and acquired immunodeficiency syndrome in macaques: Pathologic observations and transmission studies. Am. J. Pathol. 119: 253-263, 1985.

Tsai, C. C., Warner, T., Hideo, U., Giddens, W. E., and Ochs, H. D.: Subcutaneous fibromatosis associated with an acquired immune deficiency syndrome in pig-tailed macaques. Am. J. Pathol. 120: 30-37, 1985.

Slides 83 & 84

History. This is tissue from a 1-year-old 100-kg female mixed-breed bovine that was found dead.

Gross Pathology. The rumen wall was hemorrhagic with darkened areas up to 10 cm in diameter scattered over the surface; there was hemorrhage in the omasum, abomasum, small intestine, and cecum.

Diagnosis. Rumen and omasum: Rumenitis and omasitis, necrosuppurative, diffuse, moderate to severe, with multifocal vasculitis, thrombosis, and fungal hyphae, mixed-breed, bovine.

Contributor's Comment and Conference Note. This heifer had gained access to seed corn. Death was attributed to rumenitis and acidosis. Opportunistic infections with fungi of the Mucor, Rhizopus, and Absidia genera are associated with rumenitis, as is Fusobacterium necrophorum; fungal cultures were not done in this case, however.

Contributor. School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA.

Suggested reading. Barker, I. K., and Van Dreumel, A. A.: The alimentary system. In: Pathology of Domestic Animals, Jubb, K. V. F., Kennedy, P. C., Palmer, N. (eds). Vol 2, 3rd Ed., Academic Press, Inc., 1985, pp. 33-36.

Slide 85

History. A flock of 70,000 layer chickens had a 1-month history of decreased production, respiratory distress, and death. The mortality rate was 75-80%; the morbidity rate was 10%. Ten birds were necropsied.

Gross Pathology. The birds had a diffuse yellow-white caseous pseudomembrane that covered the mucosa of the pharynx, larynx, and trachea. The tracheal mucosa was red-tinged and markedly congested; the tracheal lumen contained plugs of sloughed necrotic exudate. The combs and wattles of some birds had multifocal to coalescing brown-red cutaneous crusts and scabs.

Diagnosis. Trachea: Tracheitis, proliferative, subacute, diffuse, severe, with ballooning degeneration and eosinophilic intracytoplasmic inclusion bodies, chicken, avian.

Contributor's Comment and Conference Note. Fowl-pox can present in one of three forms: as cutaneous lesions usually involving skin of the head, as diphtheritic lesions of the mouth and esophagus, or as coryza-like lesions of the nasal sinuses. The diphtheritic membranes of wetpox are usually confined to the nasal sinuses, mouth, pharynx, esophagus, and crop. Marked involvement of the larynx and trachea is not common.

Respiratory distress and death in this case were attributed to tracheal pseudomembranes and plugs that occluded the tracheal lumen and resulted in asphyxiation. The trachea has marked epithelial hyperplasia with multifocal inflammation and necrosis. Numerous epithelial cells contain eosinophilic 10- to 20-um intracytoplasmic inclusions (Bollinger bodies). Some sections have marked accumulation or necrotic cellular debris in the tracheal lumen and moderate submucosal fibrosis.

Contributor. College of Veterinary Medicine, University of Illinois, Urbana, IL.

Suggested reading.

Brown, J. P., Twardzik, D. R., Marquardt, H., and Todaro, G. J.: Vaccinia virus encodes a polypeptide homologous to epidermal growth factor and transforming growth factor. Nature 313: 491-492, 1985.

Tripathy, D. N., and Cunningham, C. H.: Avian Pox, In: Disease of Poultry, Hofstad, M. S., Barnes, H. J., Calnek, B. W., Reid, W. M., Yoder,
H. W. (eds.). 8th Ed., Iowa State University Press, 1984, pp. 524-534.

Slide 86

History. This tissue is from one of several sows that aborted within a 2-week period. There were no signs of illness in the sows; this sow aborted near term.

Gross Pathology and Laboratory Results. Four fetuses were presented. One was well formed and grossly normal but was submitted with a thickened, leathery placenta. Two fetuses were approximately two-thirds of the crown/rump length of the first; one had a normal placenta, and the other placenta was irregularly thickened. The fourth fetus and placenta were shrunken and dehydrated. Homogenates of formalin-fixed placentas contained many spirochetes that were positive to a Leptospira pomona fluorescent-antibody preparation.

Diagnosis. Placenta, allantois: Placentitis, necrotizing, subacute, multifocal, mild to moderate, breed unspecified, porcine.

Contributor's Comment and Conference Note. Large numbers of spirochetes were demonstrable with silver stains in the areas of inflammation, located almost exclusively on the allantoic side of the chorio-allantois. Leptospira spp have an affinity for the kidney, liver, and pregnant uterus. Stillbirths and the birth of live but weak piglets are typical; autolyzed fetuses may be delivered at parturition due to infection in utero. Most abortions due to leptospirosis occur in late gestation.

Contributor. Veterinary Laboratory Services, Guelph, Ontario, Canada.

Suggested reading.

Hanson, L. E., and Tripathy, D. N.: Leptospirosis. In: Diseases of Swine, Lehman, A. D., Straw, B., Glock, R. D., Mengeling, W. L., Penny, R. H. C., Scholl, E. (eds.). 6th Ed., Iowa State University Press, 1986, pp. 591-598.

Slide 87

History. This 10-year-old Arabian stallion was presented for breeding soundness examination. A palpable mass was detected in his left testicle.

Gross Pathology. A 4x2x2-cm discrete testicular mass was submitted. The cut surface was gray and soft and had an irregular lobular appearance.

Diagnosis. Testicle: Mixed germ cell-sex cord-stromal tumor, Arabian, equine.

Contributor's Comment and Conference Note. The neoplasm contains two distinct cell populations. The majority are Sertoli-like cells that have a tendency to line the periphery of tubules; they have oval nuclei with finely stippled chromatin, a small amount of cytoplasm, and elongate cell outlines. The second population consists of cells of germ cell origin; they are larger, have abundant pale-staining cytoplasm and central vesicular nuclei. Structures resembling Call-Exner bodies are present within the neoplasm, and interstitial cells are present multifocally within the connective tissue stroma.

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

Suggested reading. Cullen, J. M., Whiteside, J., Umstead, J. A., and Whitacre, M. D.: A mixed germ cell-sex cord-stromal neoplasm of the testis in a stallion. Vet. Pathol. 24: 575-577, 1987.

Slide 88

History. This 5-year-old female appaloosa mare was one of three that were pastured together. Ten days previously one of the other mares died; necropsy was not performed. This mare was depressed and was recumbent for 24 hours prior to death.

Gross Pathology. Severe hydropericardium was present. The pericardial fluid was yellow and cloudy. There was yellowish-tan discoloration of the myocardial musculature, most severely affecting the right ventricle.

Diagnosis. Heart, myocardium: Degeneration and necrosis, multifocal, severe, appaloosa, equine.

Contributor's Comment and Conference Note. Examination of the pasture in which the horses had grazed revealed that they had had access to white snakeroot (Eupatorium rugosum). Leaves and stems of the plant contain the toxic agent tremetol. Myocardial degeneration and necrosis is the most significant gross and microscopic lesion in E rugosum toxicity. Centrolobular vacuolar change (fatty degeneration) of the liver is another common finding. Mild degeneration along with necrosis of some skeletal muscles is occasionally reported.

Contributor. Murray State University, Hopkinsville, KY.

Suggested reading. Olson, C. T., Keller, W. C., Gerken, D. F., Reed, S.M.: Suspected tremetol poisoning in horses. J. Am. Vet. Med. Assoc. 185: 1001-1003, 1984.

Slide 89

History. This is tissue from a 3-month-old female Landrace porcine that was presented with skin lesions.

Gross Pathology. There were extensive areas of hard, necrotic, dark reddish-black skin over the dorsum, face, and rump. Multifocal 4x4 cm foci were dull reddish-pink, slightly demarcated, and distinctly square to rhomboid. No visceral lesions were present.

Diagnosis. Haired skin and subcutis: Dermatitis and panniculitis, perivascular and periadnexal, subacute, multifocal, mild to moderate, with multifocal vasculitis and thrombosis, and focally extensive epidermal necrosis, Landrace, porcine.

Contributor's Comment and Conference Note. The gross and microscopic appearance of the skin lesions is characteristic of Erysipelothrix rhusiopathiae infection in swine. Other septicemic diseases considered by conference participants included salmonellosis, hog cholera, and African swine fever. Since some sections had epidermal necrosis but no apparent vascular lesions, sunburn and contact dermatitis were included in the differential diagnosis.

Contributor. The Ohio State University, Columbus, OH.

Suggested reading. Wood, R. L.: Erysipelas. In: Diseases of Swine, Leman, A. D., Straw, B., Glock, R. D., Mengeling, W. L., Penny, R. H. C., Scholl, E. (eds). 6th Ed, Iowa State University Press, Ames, 1986, pp. 571-583.

Slide 90

History. This adult male goose was found dead with no premonitory signs.

Gross Pathology. At necropsy, the heart appeared enlarged. The proventriculus contained mucus, and the entrance to the gizzard was hemorrhagic.

Diagnosis. Ventricular/proventricular junction: Ventriculitis and proventriculitis, chronic-active, diffuse, mild to moderate, with diffuse disruption of the kaolin lining and intramucosal strongylid nematodes, goose, avian.

Contributor's Comment and Conference Note. The strongylid nematodes are most likely either Amidostomum anseris or Epomidiostomum sp, based on host, location, and pathogenic effect. These worms parasitize ducks and geese by burrowing beneath the cuticular lining of the gizzard into the mucosa and submucosa. They may also reside in the esophagus and proventriculus.

Contributor. 10th Medical Laboratory, APO NY.

Suggested reading. Soulsby, E. J. L.: Helminths, Arthropods and Protozoa of Domesticated Animals. 7th Ed, Lea & Febiger, 1982, pp. 192-193.

Slide 91

History. This 3-week-old female polled Hereford X shorthorn calf had opisthotonos and died. Three others in the same group also had fatal nervous disorders; all were less than 2-months old and had been grazing with lambing ewes.

Gross Pathology and Laboratory Results. The anterior chambers of both eyes contained fibrin clots. There was severe serofibrinous effusion throughout the peritoneal cavity. Chlamydia sp was demonstrated in peritoneal fluid by direct smears and by egg inoculation.

Diagnosis. Brain stem: Encephalitis, subacute, diffuse, moderate, with multifocal microabscesses, vasculitis and thrombosis, Hereford X shorthorn, bovine.

Contributor's Comment and Conference Note. This case is an example of sporadic bovine encephalomyelitis due to Chlamydia psittaci.

Lesions were present in the cerebrum, cerebellum, and brainstem. The perivascular reaction principally involves mononuclear cells; there are glial nodules and numerous neutrophils, particularly where there is parenchymal necrosis and fibrin accumulation.

Sporadic bovine encephalomyelitis occurs primarily in cattle less than 3 years old, with calves less than 6 months of age being most susceptible. Serofibrinous peritonitis is the most consistent gross lesion; inflammation of other serous membranes and synoviae are common accompaniments. Microscopically, encephalomyelitis can be present at all levels of the brain and spinal cord but is most severe at the base of the brain.

Contributor. Regional Veterinary Laboratory, Wollongbar, New South Wales, Australia.

Suggested reading. Sullivan, N. D.: The nervous system. In: Pathology of Domestic Animals, Jubb, K. V. F., Kennedy, P. C., Palmer, N. (eds). Vol 1, 3rd Ed, Academic Press, Inc., 1985, pp. 302-304.

Slide 92

History. This 3-year-old male German shepherd dog was presented to the referring veterinarian with hypersalivation, tachypnea, and a rectal temperature of 41°C. The animal died 48 hours after showing the first clinical signs.

Gross Pathology. No gross lesions were observed.

Diagnosis. Brain stem: Encephalomeningochoroiditis, necrotizing, subacute, diffuse, mild to moderate, with multifocal microabscesses and vasculitis, German shepherd dog, canine.

Contributor's Comment and Conference Note. Pseudorabies is an acute infectious disease that affects most wild and domestic animal species. In the canine, pseudorabies has a rapid course, with death occurring 24 to 48 hours after onset of clinical signs. Knowledge of clinical signs of extreme pruritus and self-mutilation in the absence of overt dermatologic disease and of a history of association with infected swine, especially ingestion of virus-contaminated tissues, is an important diagnostic tool.

Both the lesions in this case and their localization are characteristic of pseudorabies infection in dogs. In the contributor's experience, intranuclear inclusion bodies are not a constant finding in Aujeszky-infected dogs.

Neuronophagia with lymphohistiocytic and neutrophilic reaction are frequently observed. The diagnosis was confirmed by immunohistochemistry and by positive animal (rabbit) inoculation test.

Contributor. Institut fur Veterinar-Pathologie, Justus-Liebig-Universitat, Giessen, F.R.G.

Suggested reading.

Shell, L. G., Ely, R. W., and Crandell, R. A.: Pseudorabies in a dog. J. Am. Vet. Med. Assoc. 178: 1159-1161, 1981.

Whitley, R. D., and Nelson, S. L.: Pseudorabies (Aujeszky's disease) in the canine: Two atypical cases. J. Am. An. Hosp. Assoc. 16: 69-72, 1980.

Slide 93

History. This male Fischer 344 rat was a control in a 2-year carcinogenesis bioassay. It was killed when moribund at 101 weeks of age.

Gross Pathology. There were "miliary nodules" bilaterally on the epididymis and vaginal tunica. The tumors were beige to brown and soft.

Diagnoses. 1. Testicle: Interstitial cell tumors, multiple, Fischer 344 rat, rodent. 2. Testicle, tunica vaginalis: Mesothelioma.

Contributor's Comment and Conference Note. This case demonstrates two neoplastic lesions frequently encountered in male Fischer rats. Mesotheliomas of vaginal tunica origin are not uncommon lesions in aging male Fischer 344 rats and can spread to distant peritoneal sites. Testicular interstitial cell tumors are extremely common spontaneous lesions in aging F344 rats.

Contributor. National Institute of Environmental Health Sciences, Research Triangle Park, NC.

Suggested reading.

Gould, D. H.: Mesotheliomas of the tunica vaginalis propria and peritoneum in Fischer rats. Vet. Pathol. 14: 372-379, 1977.

Mostofi, F. K., and Bresler, V. M.: Tumours of the Testis. In: Pathology of Tumours in Laboratory Animals, Turusov, V. S. (ed.). Vol 1, Part 2. International Agency for Research on Cancer, Lyon, 1976, pp. 135-150.

Slide 94

History. A 2-year-old male New Zealand white rabbit had a 3-day history of lethargy, anorexia, fever, and diarrhea, with bloody feces passed on the third day of illness. He was hospitalized and treated with fluids and antibiotics but died during the night.

Gross Pathology and Laboratory Results. At necropsy, multiple 1- to 5-mm pale-yellow foci were seen disseminated in the liver, spleen, kidney, sacculus rotundus, vermiform appendix, and mesenteric lymph nodes. Yersinia pseudotuberculosis was isolated from the liver, spleen, lung, and bone marrow.

Diagnoses. 1. Liver: Hepatitis, necrotizing, random, acute to subacute, multifocal to coalescing, severe, with extensive coagulative necrosis and bacterial colonies compatible with Yersinia sp, New Zealand white rabbit, lagomorph. 2. Spleen: Splenitis, necrotizing, acute, disseminated, severe, with bacterial colonies compatible with Yersinia sp.

Contributor's Comment and Conference Note. Yersinia pseudotuberculosis, a gram-negative coccobacillus, infects a broad range of animal species but is considered to be primarily a pathogen of rodents and birds. Following ingestion by a susceptible host, the organism enters through the intestine, spreads to the regional lymph nodes, becomes septicemic, and disseminates widely, producing caseonecrotic foci in multiple organs. The liver is frequently the most obviously involved organ, with 1- to 10-mm diameter whitish foci scattered throughout the hepatic parenchyma. The lesions in this animal also affected lymphoid follicles in the spleen, lymph nodes, sacculus rotundus, and vermiform appendix.

Contributor. USDA/FSIS, Beltsville, MD.

Suggested reading. Barker, I. K., and Van Dreumel, A. A.: The alimentary system. In: Pathology of Domestic Animals, Jubb, K. V. F., Kennedy, P. C., Palmer, N. (eds.). Vol 2, 3rd Ed., Academic Press, Inc., 1985, p. 143.

Slide 95

History. This approximately 11-year-old male African green monkey (Cercopithecus aethiops) had been fed a diet containing 0.75 mg cholesterol/Kcal.

Gross Pathology. There were miliary, pinpoint, white foci throughout the liver and marked thickening of the wall of the gallbladder, which was bright white and very firm. On cut section, the gallbladder was seen to contain a small quantity of gelatinous yellow bile and a single gallstone.

Diagnoses. 1. Bile ducts: Hyperplasia, adenomatous, diffuse, moderate, African green monkey (Cercopithecus aethiops), primate. 2. Bile duct: Cholelith, intraluminal, with associated epithelial loss and chronic granulomatous cholangitis. 3. Liver: Cholangiohepatitis, subacute, diffuse, moderate. 4. Liver: Hepatitis, necrotizing, random, subacute, multifocal, mild.

Contributor's Comment and Conference Note. Presumably, the cholesterol-containing diet and hypercholesterolemia predisposed this monkey to develop cholesterol-containing gallstones; cholecystitis, however, is uncommon in cholesterol-fed animals.

The spontaneous occurrence of cholelithiasis in animals is rare but is occasionally reported as an incidental finding at necropsy or, less commonly, as a cause of biliary tract obstruction. Gallstones in humans, however, are frequent findings; because of the importance of human cholelithiasis, numerous animal models of human cholesterol gallstone disease have been developed.

Contributor. Bowman Gray School of Medicine, Winston-Salem, NC.

Suggested reading.

Gurll, N., and DenBesten, L.: Animal models of human cholesterol gallstone disease: A review. Lab. Anim. Sci. 28: 429-432, 1978.

Robbins, S. L., Cotran, R. S., and Kumar, V.: Pathologic Basis of Disease. 3rd Ed, W. B. Saunders Co., pp. 941-952, 1984.

Slide 96

History. This adult female South African clawed frog (Xenopus laevis) became lethargic, anorectic, and cachectic after developing an erythematous ventral abdominal rash with brownish thickened patches that had become generalized. Prior to euthanasia, the frog's skin had lost most of its slime.

Gross Pathology. The normally expanded abdomen and thigh muscles were greatly reduced in size. The skin of the body and limbs was generally finely granular and on the ventral, normally unpigmented portions, was brownish.

Diagnosis. Skin: Epidermitis, necrotizing, subacute, multifocal, mild to moderate, with mild diffuse acanthosis and intraepithelial nematodes compatible with Capillaria xenopodis, South African clawed frog (Xenopus laevis), amphibian.

Contributor's Comment and Conference Note. Capillaria xenopodis, also called Pseudocapillaroides xenopi, is apparently a common infection in laboratory frogs purchased from some sources. Frogs can harbor the infection asymptomatically. The incubation period in this case was 9 to 13 months. Transmission is probably via ingestion of the larvated egg. In addition to the epidermal lesions present in this case, the moderator noted that dermal mucous glands have distended lumina with cells that are reduced in size, suggesting mucus depletion.

Contributor. College of Veterinary Medicine, University of Tennessee, Knoxville, TN.

Suggested reading. Cromeens, D. M., Robbins, V. W., and Stephens, L. C.: Diagnostic exercise: cutaneous lesions in frogs. Lab. Anim. Sci. 37: 58-59, 1987.

Slide 97

History. The physical condition of an 11-month-old female guppy (Poecilia reticulata) deteriorated over a 72-hour period. Clinical signs included apparent loss of body weight, dull color, dark eyes, anorexia, scoliosis, and weak, ineffective swimming motions with difficulty in maintaining equilibrium. Several days later, a second adult female guppy demonstrated similar clinical signs. Both fish were euthanized and processed routinely for histologic examination.

Gross Pathology and Laboratory Results. Because of the small size of the fish, no necropsy was performed. A sample of aquarium water was cultured and yielded growth of an acid fast bacillus.

Contributor's Comment and Conference Note. The causative bacteria of piscine tuberculosis have been identified as Mycobacterium marinum (formerly M piscium and M platypoecilus) and the less common M fortuitum. The habitat of M marinum is not known; however, carrier fish with subclinical infections are responsible for most infections in aquaria. Clinical signs are variable and generally nonspecific as in this outbreak. The disease course may be acute, with death occurring prior to the development of lesions, but it is more commonly chronic and progressive.

At necropsy, miliary, grayish-white tubercles of variable size, which may coalesce to form tumorlike masses, may be found in virtually any organ. The liver, spleen, and kidney are especially common sites. Tubercles generally consist of an outer fibrous wall surrounding a central zone of epithelioid macrophages, hemosiderin-containing cells, and tissue debris. Many acid-fast bacilli are regularly seen in the cytoplasm of macrophages. Caseation and Langhans giant cells are uncommon. Calcification has not been reported.

The source of infection in this incident was not determined. The organism isolated from the aquarium water may not have been the cause of the outbreak. Since it was not obtained directly from the infected fish, it may have been an incidental nonpathogenic saprophyte.

Contributor. USAMRIID, Fort Detrick, MD.

Suggested reading.

Dulin, M. P.: A review of tuberculosis (mycobacteriosis) in fish. Vet. Med./ S. A. C., May 1979, pp. 731-735.

Leibovitz, L.: Fish tuberculosis (mycobacteriosis). J. Am. Vet. Med. Assoc. 178: 415, 1980.

Slide 98

History. These are tissues from multiple adult white perch (Morone americana) from Chesapeake Bay.

Gross Pathology. The fish had dark-brown livers.

Diagnosis. Liver: Cholangioma, white perch (Morone americana), piscine. (Not present in all sections)

Contributor's Comment and Conference Note. These livers are from white perch that have an age-related, progressive accumulation of hepatic copper. The contributors have found similarly affected white perch in various regions of the Chesapeake Bay (levels often exceed 1000 ug/g wet weight in older fish). All examined perch have had elevated hepatic copper levels, usually several hundred times those seen in striped bass (Morone saxitilis) or sunfish (Lepomis gibbosus) that live in the same waters or seen in laboratory rats that were sampled. This condition may represent an inborn species-specific bioaccumulation of copper in the white perch.

Histologically, enlargement of melanomacrophage centers is commonly seen, and hepatocytes have varisized cytoplasmic granules that represent tertiary lysosomes containing copper (as shown by rubeanic acid

staining, subcellular fractionation, and electron probe microanalysis). Some livers have mild peribiliary inflammation and fibrosis, which apparently progresses to bridging fibrosis, with bile duct hyperplasia and marked disruption of the hepatic architecture in older fish.

Conference participants were generally not able to diagnose hepatocellular copper accumulation based on the H&E-stained sections. Increased granularity of the cytoplasm of hepatocytes and enlargement of melanomacrophage centers, as mentioned by the contributor, are difficult to assess.

Contributor. Johns Hopkins University School of Medicine, Baltimore, MD.

Suggested reading. Bunton, T. E., Baksi, S. M., George, S. G., and Frazier, J. M.: Abnormal hepatic copper storage in a teleost fish (Morone americana). Vet. Pathol. 24: 515-524, 1987.

Slide 99

History. This 108-week-old male untreated control Fischer 344 rat from a 2-year carcinogenicity/toxicity study was sacrificed in a moribund condition.

Gross Pathology. The lungs contained multiple firm 0.5- to 5.0-mm gray nodules.

Diagnosis. Lung: Chordoma, metastatic, Fischer 344 rat, rodent.

Contributor's Comment and Conference Note. Multiple tumor emboli, composed of physaliphorous and stellate cells, distend many pulmonary blood vessels. The cells contain an oval to round nucleus with stippled chromatin, frequently have a small central nucleolus, and have up to two mitotic figures per high-power field. A thin fibrovascular stroma divides the cells into microlobules. The cytoplasmic vacuoles did not stain for fat with Sudan IV.

Chordomas are rarely reported in man, dogs, mink, and rats. They are believed to arise from vestigial remnants of the notochord. In rats, chordomas have been reported in the lumbar, sacrococcygeal, and caudal cervical vertebrae. As in the present case, only pulmonary metastases have been found in some animals. In man, chordomas affect males about twice as often as females. A similar male/female ratio has been noted in rats.

Contributor. NIEHS, Research Triangle Park, NC.

Suggested reading. Stefanski, S. A., Elwell, M. R., Mitsumori, K., Yoshitomi, K., Dittrich, K., and Giles, H. D.: Chordomas in Fischer 344 rats. Vet. Pathol. 25: 42-47, 1988.

Slide 100

History. This adult female crossbred sheep was experimentally inoculated with sheep-pox virus. She died 2 weeks post inoculation.

Gross Pathology. There were proliferative and necrotic lesions present on the eyelids, nostrils, vulva, and udder. The lungs were diffusely mottled and slightly edematous and had multifocal areas of consolidation.

Diagnosis. Lung: Pneumonia, proliferative, serofibrinous and suppurative, multifocal to diffuse, moderate, with type II pneumocyte hyperplasia, lymphoplasmacytic peribronchiolitis, perivasculitis, and pleuritis, and histiocytic eosinophilic intracytoplasmic inclusions, crossbreed, ovine.

Contributor's Comment and Conference Note. Sheep-pox, the most severe pox disease of domestic animals, occurs in both epidemic and endemic forms in Africa, Asia, and the Middle East. Transmission is by contact with diseased animals or a contaminated environment. The virus can enter either via the respiratory or cutaneous routes.

Sheep-pox is a systemic disease, primarily affecting skin and lung, with lesser involvement of heart, kidney, liver, adrenals, thyroid, and pancreas. Lesions are proliferative and typically involve cellules claveleuses or "sheep-pox cells." These are virus-infected macrophages or fibroblasts that have large vacuolated nuclei with marginated chromatin and often single or multiple eosinophilic intracytoplasmic inclusions. Accumulation of the characteristic "sheep-pox cells" or cellules claveleuses is not restricted to the lungs of infected sheep. These cells may be identified in other internal organs, as well as in the dermis during the papular stage of the disease.

Contributor. Plum Island Animal Disease Center, Greenport, L.I., NY.

Slide 101

History. Three weeks prior to presentation this 4-year-old female Yorkshire terrier had five puppies, all of which died. She was depressed after the birth of the puppies and had a slight vaginal discharge. During a routine spay, two intra-abdominal pups were found. A surgical biopsy specimen of the right uterine horn was submitted in formalin.

Diagnosis. Uterus: Hemorrhage and necrosis, focally extensive to diffuse, severe, transmural, with trophoblastic invasion and multifocal

subacute metritis (subinvolution of placental sites), Yorkshire terrier, canine.

Contributor's Comment and Conference Note. Although the gross pathologic findings were not available in this case, it can be presumed that there were ellipsoidal enlargements located in the uterine horns in the areas of previous placental attachment sites. Complete clinical history is required to distinguish subinvolution from normal uterine involution as they have similar gross appearances. The microscopic features of this case are typical. Syncitiated or individual trophoblast-like cells (referred to by some authors as decidual cells) may extend into the myometrium only, may be found transmurally, or can even perforate through the serosal surface in severely affected uteri.

Contributor. Experimental Pathology Laboratories, Inc., Research Triangle Park, NC.

Suggested reading.

Al-Bassam, M. A., Thomson, R. G., O'Donnell, L.: Involution abnormalities in the postpartum uterus of the bitch. Vet Pathol. 18: 208-218, 1981.

Beck, A. M., McEntee, K.: Subinvolution of placental sites in a postpartum bitch. A case report. Cornell Vet. 56: 269-277, 1966.

Slide 102

History. This 11-year-old neutered female beagle-mix canine presented with a multinodular 6 cm diameter perianal mass that was surgically removed and submitted for histopathological examination. Preoperative serum calcium was 15.4 mg/dl. The mass recurred and was again removed, 7 months later. At this second removal an 8x10 cm diameter sublumbar mass was excised, as were numerous smaller masses around the iliac blood vessels. At the time of this second surgery, serum calcium was 15.8 mg/dl before surgery and fell to 7.8 mg/dl postoperatively; serum phosphorus was 3.5 mg/dl before surgery and 3.0 mg/dl after surgery.

Gross Pathology. The biopsy specimen consisted of several discrete nodules approximately 2 cm in diameter. The lesions were encapsulated and firm. The cut surface was homogeneous and grayish.

Diagnosis. Perianal mass (per contributor): Adenocarcinoma, solid, beagle-cross, canine.

Contributor's Comment and Conference Note. This case displays many of the characteristic features of adenocarcinoma of apocrine glands of the anal sac, including sex and age predisposition, clinical course, histomorphology, and hypercalcemia, which is responsive to tumor removal. The tumor has a predominantly solid growth pattern, with occasional small acinar and tubular structures and pseudorosettes.

In dogs, hypercalcemia and hypophosphatemia are occasionally associated with neoplasms of non-parathyroid origin that induce a syndrome called pseudohyperparathyroidism or hypercalcemia of malignancy. This metabolic disorder is most commonly associated with lymphosarcoma in dogs and cats. Pseudohyperparathyroidism is also consistently associated with adenocarcinoma of the apocrine glands of the anal sac because these neoplasms frequently produce a humoral substance that stimulates osteoclastic resorption of bone and activates renal 1-alpha-hydroxylase to produce inappropriately high levels of 1,25-dihydroxycholecalciferol.

Contributor. Experimental Pathology Laboratories, Inc., Research Triangle Park, NC.

Suggested reading.

Capen, C. C.: The endocrine glands. In: Pathology of Domestic Animals, Jubb, K. V. F., Kennedy, P. C., Palmer, N. (eds.). Vol. 3, 3rd ed., Academic Press, Inc., 1985, pp. 264-266.

Meuten, D. J., Cooper, B. J., Capen, C. C., Chew, D. J., Kociba, G. J.: Hypercalcemia associated with an adenocarcinoma derived from the apocrine glands of the anal sac. Vet Pathol. 18: 454-457, 1981.

Slide 103

History. This 6-month-old female mixed-breed bovine was one of 100 heifers purchased a week earlier. The animal became depressed and began exhibiting signs of neurological disease. The heifer rapidly went down to sternal recumbency and died within 24 hours of the first signs of illness.

Gross Pathology. Numerous 1- to 12-mm dark foci were scattered throughout the cerebral hemispheres and midbrain.

Diagnosis. Brainstem: Meningoencephalitis, necrosuppurative, multifocal, moderate, with necrotizing vasculitis, thrombosis and hemorrhage, mixed-breed, bovine.

Contributor's Comment and Conference Note. Haemophilus somnus was isolated from the brain of this animal. H somnus has been associated with meningoencephalitis, synovitis, endometritis, abortion, and pneumonia

in cattle. The organism apparently has the ability to selectively damage blood vessels and thus cause a suppurative vasculitis in many organs; vessels in the brain are particularly vulnerable, hence the characteristic gross and microscopic lesions of thrombotic meningoencephalitis (TME).

Grossly, TME is characterized by varisized areas of hemorrhagic necrosis throughout the brain, especially in the thalamus and at the junction of the gray and white matter of the cerebral cortex. A diffuse purulent meningitis involving the basilar portions of the brain may be seen in animals that survive for a day or more. Grossly visible foci of hemorrhagic necrosis and inflammation can less commonly be found in the spinal cord as well as in non-neural tissues.

The important histologic lesions in the involved areas of the brain include severe vasculitis with thrombosis, necrosis of vessel walls, and intense neutrophil accumulation within the thrombosed vessels and perivascularly. Bacterial colonies and microabscesses are often present.

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

Suggested reading.

Jackson, J. A., Andrews, J. J., and Hargis, J. W.: Experimental Haemophilus somnus pneumonia in calves. Vet. Pathol. 24: 129-134, 1987.

Stephens, L. R., Little, P. B., Wilkie, B. N., and Barnum, D. A.: Infectious thromboembolic meningoencephalitis in cattle: A review. J. Am. Vet. Med. Assoc. 178: 378-384, 1981.

Slide 104

History. Several piglets from this farm had been sick from birth. The submitted case was that of a 3-week-old male piglet that had had swollen joints since birth.

Gross Pathology. The right and left tarsal, carpal, and stifle joints were markedly swollen and firm. The opened joints contained cloudy fibrin-flecked synovia and marked proliferation of the synovial membranes. The spleen and peripheral lymph nodes were moderately enlarged. Necrotizing osteomyelitis was found in one distal phalanx.

Diagnosis. Tarsal joint (per contributor): Arthritis, fibrinonecrotic, chronic, diffuse, severe, with tendovaginitis and proliferative synovitis, breed unspecified, porcine.

Contributor's Comment and Conference Note. Actinobacillus suis was cultured from the synovia of multiple joints. Although reports of

disease due to this organism are infrequent, the disease seems to primarily affect young pigs and presents in several forms: a peracute to acute septicemia, an acute polyserositis with pleuropneumonia, or as polyarthritis. The infection is infrequent in older swine, but it can occur as multiple abscesses, endocarditis, and metritis. The chronic nature of the lesion in this piglet and the history that the piglet was born with swollen joints suggest that it was infected in utero. However, cultures from tissues from the sow were not obtained for confirmation. This piglet also had suppurative lymphadenitis and multifocal suppurative nephritis reminiscent of "navel ill" in foals caused by Actinobacillus equuli.

Contributor. Animal Health Diagnostic Laboratory, Maryland Department of Agriculture, College Park, MD.

Suggested reading.

MacDonald, D. W., Hewitt, M. P., Wilton, G. S., Rawluk, S., and Childs, L.: Actinobacillus suis infections in Alberta swine, 1973-1975: Pathology and bacteriology. Can. Vet. J. 17: 251-254, 1976.

Mair, N. S., Randall, C. J., Thomas, G. W., Harbourne, J. F., McCrea, C. T., and Cowl, K. P.: Actinobacillus suis infections in pigs. J. Comp. Path. 84: 113-119, 1974.

Slide 105

History. This is tissue from a 15-year-old female domestic cat that gradually became weak and depressed.

Gross Pathology. None reported.

Diagnosis. Bone, site unspecified: Fibrous osteodystrophy, diffuse, severe, with osteomalacia and osteopenia, breed unspecified, feline.

Contributor's Comment and Conference Note. In addition to fibrous osteodystrophy due to renal secondary hyperparathyroidism, other histologic findings included chronic membranous glomerulonephritis with renal fibrosis and atrophy; multifocal myodegeneration and mineralization of the myocardium, gastric muscularis interna, and tongue; symmetric parathyroid hyperplasia; thyroid adenoma; generalized osteodystrophy; and meningioma.

Fibrous osteodystrophy due to renal secondary hyperparathyroidism is the culmination of a complex series of events. Among the many metabolic derangements that occur in renal failure is the retention of phosphate. Hyperphosphatemia causes a consequent drop in serum calcium, which stimulates parathyroid hormone secretion. Because the failing kidney is relatively insensitive to this hormone, blood phosphate remains elevated and

there is persistent hypocalcemia along with persistent release of parathormone. Additionally, in the end-stage kidney, there is impaired production of 1,25-dihydroxycholecalciferol. Inadequate levels of vitamin D result in diminished intestinal transport of calcium, which further complicates attempts at restoring Ca/P balance.

Metabolic bone disease develops because prolonged parathyroid hormone release causes accelerated osteocytic and osteoclastic bone resorption in an attempt to restore serum calcium levels. Ultimately, there are osteoblastic production of osteoid that cannot be mineralized and fibrous replacement of bone, the essential features of fibrous osteodystrophy.

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

Suggested reading.

Capen, C. C., and Martin, S. L.: Calcium metabolism and disorders of parathyroid glands. Vet. Clin. North Am. 7: 513-547, 1977.

Jubb, K. V. F., Kennedy, P. C., and Palmer, N.: Pathology of Domestic Animals. Vol 1, 3rd Ed., Academic Press, Inc., 1985, pp. 48-50.

Slide 106

History. This 56-week-old castrated male domestic shorthair cat suddenly became lethargic and dyspneic. Heart rate was 240/minute, there was a grade IV/VI systolic murmur, and the femoral pulse was weak. Dullness of lung sounds in the ventral thorax was caused by a bilateral pleural transudate. Rectal temperature was 98°F. The cat was FeLV-positive.

Gross Pathology. Cardiomyopathy, pleural effusion, and thymic lymphosarcoma were present.

Diagnosis. Long bone: Osteomyelofibrosis, diffuse, moderate to severe, characterized by osteosclerosis and osteochondrodysplasia, domestic shorthair, feline.

Contributor's Comment and Conference Note. Myelofibrosis and osteosclerosis are myeloproliferative disorders that have been associated with both natural and experimental feline leukemia virus infections. The most consistent bony lesion in infected cats is the replacement of marrow spaces by woven bone and islands of immature connective tissue. Also described are extensive remodelling of cortical bone, subperiosteal new bone formation, replacement of lamellar bone with immature woven bone, and other changes.

Although all of the long bones of this cat's limbs were similarly involved, they appeared normal radiographically and their periosteal and articular surfaces were grossly normal. The significance and relationship of thymic lymphosarcoma, FeLV, and cardiomyopathy to the bone lesions were not established.

Contributor. Angell Memorial Animal Hospital, Boston, MA.

Suggested reading.

Fleckneil, P. A., Gibbs, C., and Kelly, D. F.: Myelosclerosis in a cat. J. Comp. Path. 88: 627-631, 1978.

Hoover, E. A., and Kociba, G. J.: Bone lesions in cats with anemia induced by feline leukemia virus. J. Natl. Cancer Inst. 53: 1277-1281, 1974.

Zenoble, R. D., and Rowland, G. N.: Hypercalcemia and proliferative, myelosclerotic bone reaction associated with feline leukovirus infection in a cat. J. Am. Vet. Med. Assoc. 175: 591-595, 1979.

Slide 107

History. This 1-month-old female thoroughbred equine nursed well when born. Swelling of the right rear pastern was noted at 2 days of age. Later in the week, the right hock became swollen. Despite treatment with gentocin, the left hock and, later, both carpi were swollen. The horse was finally euthanatized.

Gross Pathology. The carpal joints, right tibiotarsal joint, and left femorotibial joint were enlarged and contained yellow, cloudy fluid. A subcutaneous draining tract was present over the right distal femur. The umbilical vein and round ligaments of the bladder were 2 to 3 cm in diameter and filled with pus. Pulmonary and lymph node abscesses were also present. Culture of fluid from multiple joints, kidney, and brain and spinal cord yielded large numbers of Klebsiella organisms.

Diagnosis. Long bone: Osteomyelitis, suppurative, chronic, multifocal to coalescing, severe, with sequestra, thoroughbred, equine.

Contributor's Comment and Conference Note. Areas of osteonecrosis and intramedullary leukocyte infiltration were visible grossly as gray-white areas. The physis is incorporated into these inflammatory foci. Although different bacterial pathogens, including some mixed infections, can be isolated from cases of navel ill/joint ill in foals, the histopathologic changes are similar whether Klebsiella or other organisms are isolated.

Gram-negative organisms such as Escherichia coli, Salmonella spp, Actinobacillus equuli, and Klebsiella are the most common isolates from cases of osteomyelitis in foals. Hematogenous osteomyelitis is much more common in young than in old animals and is often associated with "navel ill." Infection tends to localize in the metaphysis of long bones and to extend into the diaphysis; the growth plate generally acts as a barrier preventing the spread of organisms in the other direction. In the young of some species, however, such as foals, vessels cross the growth plate from the metaphysis to the epiphysis. This is a potential route for spread of infection toward the epiphysis.

Contributor. College of Veterinary Medicine, Iowa State University, Ames, IA.

Suggested reading. Jubb, K. V. F., Kennedy, P. C., and Palmer, N.: Pathology of Domestic Animals. Vol 1, 3rd Ed., Academic Press, Inc., 1985, pp. 64-67.

Slide 108

History. These are tissues from 12 pathogen-free BALB/c nu/nu mice that were inoculated with an isolate of a common infectious agent of mice.

Gross Pathology. The livers of all mice were pale, yellow-tan, and friable, with minute hemorrhages in the capsular surface.

Diagnosis. Liver: Hepatitis, necrotizing, acute, multifocal to coalescing, severe, BALB/cAnNCr nu/nu mouse, rodent.

Contributor's Comment and Conference Note. The mice were inoculated intraperitoneally, orally, and nasally with mouse hepatitis virus (MHV) isolated from clinically normal C3H/HeN mice. In addition to the liver lesions, the nude mice had multifocal necrosis of the spleen, bone marrow, and cecal epithelium; mild multifocal meningitis and choroiditis; and numerous epithelial syncytia in the small intestine.

MHV, a coronavirus, comprises numerous strains, which vary in virulence and tissue tropism and thus differ in distribution and severity of lesions produced. Some strains replicate initially in the respiratory tract, others in the intestine. Respiratory strains tend to disseminate widely, affecting to various degrees the liver, lymphoid organs, brain, and other tissues. Enterotropic strains affect primarily the small intestine, cecum, and colon, and they have less tendency to disseminate than do respiratory strains. Respiratory and enteric patterns can overlap, however.

Mice vary in susceptibility according to age, genotype, and immunocompetence. Clinical disease generally occurs in infant or immunocompromised mice. Nude mice are susceptible to both acute fulminant disease, as in this case, and "wasting syndrome" associated with chronic active hepatitis, encephalitis, lymphoid lesions, and enteric infection.

The differential diagnosis for necrotizing hepatitis in the nude mouse includes mouse hepatitis virus infection, ectromelia, salmonellosis, reovirus 3 infection, Tyzzer's disease, lymphocytic choriomeningitis, corynebacteriosis, and murine cytomegalovirus infection.

Contributor. University of Alabama at Birmingham, Birmingham, AL.

Suggested reading.

Carthew, P.: Histopathological characterization of the naturally occurring hepatotropic virus infections of nude mice. J. Path. 142: 79-85, 1984.

Ward, J. M., Collins, M. J., and Parker, J. C.: Naturally occurring mouse hepatitis virus infection in the nude mouse. Lab. Anim. Sci. 27: 372-376, 1977.

Slide 109

History. Mice were procured from a commercial supplier in Sao Paulo, Brazil, and submitted for quality assurance. Prior to submission, the animals were experimentally infected with Schistosoma mansoni.

Gross Pathology. Several mice had small yellow or yellow-white spots on the surface of the liver and extending into the parenchyma.

Diagnoses. 1. Liver: Hepatitis, granulomatous, multifocal, mild to moderate, with trematode eggs, mouse, rodent. 2. Small intestine, lamina propria: Trematode eggs. 3. Small intestine, enterocytes: Karyomegaly, with basophilic intranuclear inclusion bodies, diffuse, minimal. 4. Small intestine, luminal surface and glandular crypts: Protozoa, diffuse, mild, compatible with Spironucleus sp. 5. Large intestine, lumen: Oxyurid nematodes, multiple. 6. Large intestine, mucosa: Coccidia, intracellular, diffuse, mild.

Contributor's Comment and Conference Note. Although the schistosomiasis was experimentally induced, these mice were naturally infected with several different entities sometimes encountered in laboratory mice.

Syphacia obvelata and Aspicularis tetraptera are common, relatively nonpathogenic, oxyurids of mice. These pinworms are found in the cecum

and colon, cannot be differentiated histologically, and have direct life cycles.

Natural infection with adenovirus is usually subclinical, but the virus can produce disease when inoculated into suckling mice. The virus replicates in the heart, brain, and kidney, causing necrosis of these tissues; necrosis with subsequent calcification of the spleen and adrenal gland may also be seen. Intranuclear viral inclusions may be found in any of these tissues and in the small intestine of nude mice.

Spironucleus (Hexamita) is a flagellated protozoan parasite that inhabits the small intestine and cecum of mice, rats, and hamsters, particularly in the crypts of Lieberkuhn. The life cycle is direct, and transmission is by the fecal-oral route. The organism may be pathogenic in stressed animals, producing catarrhal duodenitis and mortality in young mice.

Contributor. Walter Reed Army Institute of Research, Washington, DC.

Suggested reading.

Flynn, R. J.: Parasites of Laboratory Animals. Iowa State University Press, 1973, pp. 128-130, 144, 236-239.

Otten, J. A., and Tennant, R. W.: Mouse adenovirus. In: The Mouse in Biomedical Research, Foster, H. L., Small, J. D., and Fox, J. G. (eds.). Vol II, Academic Press, Inc, 1982, pp. 335-340.

Wescott, R. B.: Helminths. In: The Mouse in Biomedical Research, Foster, H. L., Small, J. D., and Fox, J. G. (eds.). Vol II, Academic Press, Inc, 1982, pp. 374-375.

Slide 110

History. This is tissue from an 806-day-old female Fischer 344 rat that died near the completion of a longterm study.

Gross Pathology. The left atrium was slightly enlarged.

Diagnoses. 1. Heart: Endocardial schwannoma, Fischer 344 rat, rodent. 2. Heart, left atrium: Thrombus, mural, focal.

Contributor's Comment and Conference Note. Schwannomas or neurilemomas that arise within the hearts of rats can be either endocardial or intramural. Although both apparently arise from Schwann cells and form patterns that are typical of nerve sheath neoplasms, they have certain differences. Endocardial schwannomas always involve the left ventricle but can extend into the subendocardium of any of the adjacent cardiac chambers. The smallest endocardial schwannomas are little more than a subendocardial layer of spindle cells. As they enlarge, they infiltrate the

adjacent myocardium, sometimes nearly replacing the interventricular septum; they may extend into the pericardial connective tissue or metastasize to other organs. In comparison, intramural schwannomas tend to form more discrete nodular masses and usually arise within either the left ventricle or interventricular septum. They grow by expansion with minimal infiltration and do not metastasize.

Contributor. Harry G. Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio.

Suggested reading. Alison, R. H., Elwell, M. R., Jokinen, M. P., Dittrich, K. L., and Boorman, G. A.: Morphology and classification of 96 primary cardiac neoplasms in Fischer 344 rats. Vet. Pathol. 24: 488-494, 1987.

Slide 111

History. This 6-month-old male mixed-breed dog was given high doses of methylprednisolone for 2 weeks. He was then given 10 million oocysts/ sporocysts of Caryospora bigenetica orally.

Gross Pathology. Ten days post inoculation, a diffuse erythematous dermatitis was noted with prominent edema of the face, especially involving periorbital regions, and lips and foot pads.

Diagnosis. Haired skin: Dermatitis, pyogranulomatous, diffuse, mild to moderate, with marked edema and intracellular protozoa, mixed-breed, canine.

Contributor's Comment and Conference Note. There is a diffuse dermatitis and cellulitis with many coccidial organisms. Most gametocytic (sexual) stages of the parasites are present, and occasional oocysts are seen. The organisms appear to be developing within fibroblasts or macrophages. Caryospora bigenetica is a parasite of snakes and has a facultatively heteroxenous life cycle. Infection can be induced either by ingestion of oocysts or by ingestion of carrier hosts such as rodents.

Contributor. College of Veterinary Medicine, Auburn University, AL.

Suggested reading.

Sangster, L. T., Styer, E. L., and Hall, G. A.: Coccidia associated with cutaneous nodules in a dog. Vet. Pathol. 22: 186-188, 1985.

Wacha, R. S., and Christiansen, J. L.: Development of Caryospora bigenetica n. sp (Apicomplexa, Eimeriidae) in rattlesnakes and laboratory mice. J. Protozool. 29: 272-278, 1982.

Slide 112

History. This is tissue from a 7-year-old spayed female domestic shorthair cat that had a 1-month history of a nonhealing wound on the fourth digit of its left hind leg. The wound was not responsive to draining and antibiotic therapy, and the toe was amputated.

Gross Pathology. A firm, meaty 1- to 1.5-cm-diameter mass surrounded P1.

Diagnosis. Haired skin, fourth digit of left hind leg (per contributor): Dermatitis, pyogranulomatous, diffuse, severe, with dematiaceous fungi, domestic shorthair, feline.

Contributor's Comment and Conference Note. The presence of brown yeast and hyphal forms of a fungal organism in an H&E-stained section is characteristic of phaeohyphomycosis. Subcutaneous phaeohyphomycosis has been described in cats, horses, cattle, and dogs. Lesions are usually on the face or distal extremities of cats, but in horses they are more often located on the body. Microscopically, the appearance of these dematiaceous fungal elements can be extremely variable, ranging from budding forms to distinct hyphae, with many intermediate morphologic forms.

In this case, the deep dermis and subcutaneous tissues are replaced by granulomatous inflammatory tissue composed primarily of macrophages, with scattered accumulations of lymphocytes and neutrophils. Macrophages frequently contain round to oval to teardrop-shaped organisms ranging in size from 5 to 15 um and from clear to dark green-brown. Often these organisms are in groups or are budding; less frequently, continuous hyphal chains of organisms are present. Since only formalin-fixed tissue was available in this case, culture of the etiological agent was not possible.

Contributor. New York State College of Veterinary Medicine, Cornell University, Ithaca, NY.

Suggested reading.

Kwochka, K. W., Calderwood Mays, M. B., Ajello, L., and Padhye, A. A.: Canine phaeohyphomycosis caused by Drechslera spicifera: A case report and literature review. J. Am. An. Hosp. Assoc. 20: 625-633, 1984.

McKenzie, R. A., Connole, M. D., McGinnis, M. R., and Lepelaar, R.: Subcutaneous phaeohyphomycosis caused by Moniliella suaveolens in two cats. Vet. Pathol. 21: 582-586, 1984.

Slide 113

History. This 2-year-old male castrated thoroughbred horse was presented with a 1-month history of skin disease and weight loss. Clinical exam revealed the haircoat to be roughened, the skin of the head and limbs deeply excoriated and partially alopecic, and an intensely pruritic animal. The horse was also polydipsic and polyuric. Laboratory results indicated anemia, with mild eosinophilia and basophilia. The total protein dropped from 6.8 g/100 ml to 5.8 g/100 ml during the hospital course. Immunologic tests, including ANA, Coombs, LE, and indirect FA on skin, were all negative. A transtracheal wash contained numerous eosinophils.

Gross Pathology. The skin was as described clinically. Lymph nodes throughout the body were moderately enlarged. The lungs were pale pink and firm. There was a focus of proliferative arteritis at the origin of the cranial mesenteric artery. Both kidneys contained acute infarcts. The tongue was thick and cracked on the dorsal surface, and there were gingival ulcers.

Diagnoses. 1. Haired skin, site unspecified: Dermatitis, granulomatous and eosinophilic, multifocal, moderate, with dermal eosinophilic granulomas and intraepithelial eosinophilic microabscesses, thoroughbred, equine. 2. Pancreas: Pancreatitis, eosinophilic, subacute, multifocal, mild.

Contributor's Comment and Conference Note. Chronic eosinophilic dermatitis is a generalized chronic progressive exfoliative disease of horses of unknown etiology. Parasitic infestation is considered to be an unlikely cause, but autoimmune, allergic, or even viral causes are suggested by the disease's multisystemic nature, its lymphocytic and eosinophilic components, and its epitheliotropic features. This case is similar to those reported by Nimmo Wilkie et al. and Breider et al. However, the pancreatic lesions are milder and the skin lesions more severe than in those previously reported.

Additional histological lesions seen in this case included eosinophilic, lymphocytic, and plasmacytic inflammation of intestine, colon, liver, lung, lymph nodes, kidney, choroid plexus, and synovial membranes. Multifocal collagen degeneration associated with eosinophilic and granulomatous inflammation occurred in liver, lymph nodes, and intestine. The proliferative arteritis seen grossly was associated with migrating Strongylus larvae.

Contributor. College of Veterinary Medicine, Washington State University, Pullman, WA.

Suggested reading.

Barker, I. K., and Van Dreumel, A. A.: The alimentary system. In: Pathology of Domestic Animals, Jubb, K. V. F., Kennedy, P. C., and Palmer, N. (eds). Vol 2, 3rd Ed., Academic Press Inc., 1985, pp. 19-21.

Head, K. W.: XI. Tumours of the upper alimentary tract. Bull. World Health Organization 53: 145-166, 1976.

Moulton, J. E.: Tumors in Domestic Animals. 2nd Ed., University of California Press, 1978, pp. 240-246.

Slide 125

History. An 8-month-old standardbred colt was found paretic and unable to stand. The animal had had access to broiler chicken rations that contained salinomycin. At the time that he was presented for treatment, serum biochemistry revealed creatine kinase of 22,000 um/L and AST of 880 um/L. The horse became progressively weaker, did not respond to symptomatic treatment, and was finally euthanatized.

Gross Pathology. Lesions were present throughout the skeletal muscles but were particularly severe in the epaxial muscles, ventral abdominal muscles, triceps muscles, gluteal muscles and biceps femoris muscles. These muscles were soft and diffusely pale and yellow.

Diagnoses. 1. Skeletal muscle: Degeneration and necrosis, diffuse, severe, with multifocal histiocytic and neutrophilic infiltrates, standardbred, equine. 2. Skeletal muscle, small muscular arteries: Necrosis, fibrinoid, segmental, multifocal, mild. 3. Skeletal muscle: Infarct, focal.

Contributor's Comment and Conference Note. Salinomycin is a monovalent cationic ionophore antibiotic similar to monensin that is used in broiler chicken rations as a coccidiostat. Reported toxic lesions in cattle include degeneration of the myocardium with subsequent congestive heart failure and loss of pancreatic zymogen granules. Myopathy has not been previously reported in horses, but the toxic effects are not well documented in this species. Horses experimentally fed monensin additive at 125 to 279 ppm had histological lesions of toxic hepatitis and toxic tubular nephritis. Although this horse did not have liver lesions, subacute tubular epithelial necrosis was present in both kidneys. The more acute ischemic necrosis of skeletal muscle and fibrinoid necrosis in this case were due either to recumbency or to an idiosyncratic drug reaction.

Contributor. School of Veterinary Studies, Murdoch University, Murdoch, Western Australia.

Suggested reading.

Galitzer, S. J., Kruckenberg, S. M., and Kidd, J. R.: Pathologic changes associated with experimental lasalocid and monensin toxicosis in cattle. Am. J. Vet. Res. 47: 2624-2626, 1986.

Hanrahan, L. A., Corrier, D. E., and Naqi, S. A.: Monensin toxicosis in broiler chickens. Vet. Pathol. 18: 665-671, 1981.

Matsuoka, T.: Evaluation of monensin toxicity in the horse. J. Am. Vet. Med. Assoc. 169: 1098-1100, 1976.

Slide 126

History. This 2-year-old intact female Doberman pinscher canine presented with chronic weight loss, anorexia, and a glaucomatous left eye. Also noted were draining dermal pustules, ataxic gait, and facial edema.

Gross Pathology. The lungs were diffusely firm, slightly swollen, and pale pink. Multiple lymph nodes were two to five times normal size and contained a purulent exudate; and dermal lesions revealed numerous broadbased budding yeast forms, 10 to 30 um in diameter, consistent with Blastomyces dermatitidis. The thyroid glands were bilaterally small, pale tan, and very soft.

Diagnoses. 1. Thyroid: Thyroiditis, lymphocytic, chronic, diffuse, severe, with marked follicular atrophy, Doberman pinscher, canine. 2. Thyroid: Granuloma, solitary.

Contributor's Comment and Conference Note. Some sections contain granulomas with or without intralesional Blastomyces dermatitidis organisms. The lymphocytic thyroiditis presumably preceded the systemic blastomycosis. The hypertrophy of the follicular cells without colloid production suggests exhaustion of the follicular cells. Laboratory findings of low T_3, T_4, and hypercholesterolemia, along with these histologic findings, are indicative of chronic hypothyroidism due to lymphocytic thyroiditis.

Lymphocytic thyroiditis is analagous to Hashimoto's thyroiditis in humans. Lymphocytic thyroiditis has been described in dogs, nonhuman primates, Buffalo rats, the obese strain of white leghorn chickens, and man. There is a clear genetic predisposition to the disease in dogs; it occurs mostly in Great Danes, Irish setters, beagles, and Old English sheepdogs.

The immunologic basis for the disease involves the formation of specific autoantibodies against certain thyroid antigens, including thyroglobulin, a second colloid antigen, microsomal cytoplasmic antigen, and

follicular cell-surface antigens. A deficiency in antigen-specific suppressor T cells has been suggested by some authors as a means by which the unregulated formation of autoantibodies occurs. Cell-mediated autoimmune mechanisms may also participate in the process.

Contributor. Texas A&M University, College Station, TX.

Suggested reading.

Gosselin, S. J., Capen, C. C., Martin, S. L.: Histopathologic and ultrastructural evaluation of thyroid lesions associated with hypothyroidism in dogs. Vet. Pathol. 18: 299-309, 1981.

Gosselin, S. J., Capen, C. C., Martin, S. L., Krakowka, S.: Autoimmune lymphocytic thyroiditis in dogs. Vet. Immunol. Immunopathol. 3: 185-201, 1982.

Slide 127

History. This tissue is from a 10-day-old female Yorkshire piglet from a herd in which numerous piglets developed diarrhea and became progressively weak, dehydrated, and emaciated. The mortality rate was approximately 50%.

Gross Pathology. The piglets were 7% to 10% dehydrated, with matting of fecal material on the perianal region and pelvic extremities. Stomachs were approximately one-third full of uncurdled milk. Intestinal contents were yellow and mostly fluid, with a few small clumps of undigested milk.

Diagnosis. Small intestine: Enteritis, acute to subacute, diffuse, minimal, with basophilic intranuclear inclusions and intracytoplasmic coccidia, Yorkshire, porcine.

Contributor's Comment and Conference Note. Although intranuclear adenovirus particles were observed in intestinal epithelial cells, porcine adenoviruses are, in general, of questionable significance as enteric pathogens. The adenoviruses infecting swine have been isolated from normal swine as well as animals with diarrhea. Thus, the presence of adenoviral inclusions within enterocytes must be carefully interpreted. Intranuclear inclusions are also sporadically found in epithelial cells of the kidneys and lungs of infected pigs. Coccidiosis due to Isospora suis is an important cause of diarrhea and dehydration in young piglets, especially those less than 2 weeks of age; mortality in affected litters is usually low unless there is concomitant bacterial or viral infection. The greatest concentration of coccidia is in the mid-jejunum, but the ileum and even the

colon can be involved in severe infections. Coccidial organisms of the Eimeria genus can also parasitize swine, but they tend to infect postweaned pigs and are not considered to be serious pathogens.

Contributor. Veterinary Diagnostic & Investigational Laboratory, Tifton, Georgia.

Suggested reading.

Sanford, S. E., and Hoover, D. M.: Enteric adenovirus infection in pigs. Can. J. Comp. Med. 17: 396-400, 1983.

Stuart, B. P., Lindsay, D. S., Ernst, J. V., and Gosser, H. S.: Isospora suis enteritis in piglets. Vet. Pathol. 17: 84-93, 1980.

Slide 128

History. This 13-month-old male Airedale canine had a 2-week history of hematuria and anorexia. At laparotomy, a 6x5 cm irregular, ovoid mass was resected from the urinary bladder. The dog became emaciated, developed hepatomegaly and ascites, and was humanely killed 2 months after surgery.

Gross Pathology. The surface of the mass was pale pink and granular with irregular areas of yellow necrosis. Cut surfaces were pale, greasy, and firm.

Diagnosis. Urinary bladder: Botryoid rhabdomyosarcoma, Airedale, canine.

Contributor's Comment and Conference Note. Botryoid rhabdomyosarcomas are rare mesenchymal tumors that arise most commonly in the urinary bladders of young large-breed dogs. Because these neoplasms typically arise in the trigone region, they can obstruct urinary flow and cause hydronephrosis and hydroureter. Botryoid rhabdomyosarcomas are thought to originate from nests of cells within the bladder wall that have retained an embryonic pluripotent capability. The large "strap" cells which are present have the staining property of muscle; and, in some, cytoplasmic striations are demonstrable by PTAH staining. Hypertrophic osteopathy has been seen in a significant percentage of dogs with botryoid rhabdomyosarcoma.

Contributor. University of Liverpool, Liverpool, England.

Suggested reading.

Kelly, D. F.: Rhabdomyosarcoma of the urinary bladder in dogs. Vet. Pathol. 10: 375-384, 1973.

Pletcher, J. M., and Dalton, L.: Botryoid rhabdomyosarcoma in the urinary bladder of a dog. Vet. Pathol. 18: 695-697, 1981.