

Diseases of Domestic Ferrets

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Proliferative Adrenal Cortical Disease

- unilateral, bilateral, ectopic
- hormonal derangements
 - androgens, progestins, estradiol
 - rarely tumors are nonfunctional
- hyperplasia, adenoma, carcinoma, leiomyo- sarcoma, bimorphic tumors, tertoma, cysts
- surgery easiest for left
- lupron

Clinical Signs of Adrenal Disease

- alopecia
- swollen vulva
- dysuria
- distended abdomen
- petechiae

Sequelae to Adrenal Disease

- mammary gland tumors
- preputial gland tumors and cysts
- possibly adnexal gland tumors and cysts
- splenic EMH?
- hepatocellular vacuolar degeneration

Pancreatic disease

- proliferative islet lesions
- acinar cell hyperplasia, carcinoma
- islet vacuolar degeneration, diabetes mellitus
- necrotizing pancreatitis

Islet cell tumors

- mostly Beta cell tumors ‘insulioma’
- hypoglycemia
- lethargy
- seizures
- continuum: hyperplasia, adenoma, carcinoma
- multicentric, rarely metastasize

Acinar Cell Hyperplasia

- age related incidental finding
- confused with islet cell tumor
- multicentric
- generally same color as surrounding pancreatic tissue

Diabetes Mellitus

- profound hyperglycemia
- possibly a sequel to adrenal cortical disease or glucocorticoid therapy
- may or may not be reversible
- islet cell vacuolar degeneration

Pancreatitis

- mild periductal or interstitial lymphocytic pancreatitis common, esp with IBD, tumors
- necrotizing pancreatitis uncommon
 - Complications of surgery
 - drugs, toxins
 - duodenal ulcers

Enteric Diseases

- mucocele
- epulis
- megesophagus
- foreign bodies
- helicobacter
- stress
- inflammatory bowel disease
- enteric coronavirus
- Proliferative ileitis
- mycobacteria

Mucocele

- In ferrets most commonly on top of head
- Mucoïd fluid, few neutrophils in aspirates
- Complete excision can be difficult

Epulis

- Somewhat common
- Fibromatous, sometimes ossifying
- Benign
- Recurrence rare following incomplete excision

Megesophagus

- Reflux
- congenital
- Idiopathic
- Poor prognosis
- Eventually aspirate

Gastritis, Gastic/Duodenal Ulcers

- Helicobacter
- Reflux
- Inflammatory bowel disease
- Stress

- Foreign body ingestion
- Renal disease
- neoplasia

Enteric Coronavirus

- Epizootic catarrhal enteritis
- Older animals more severely affected
- Short course green slimy diarrhea
- Highly contagious
- High morbidity, low mortality

Inflammatory Bowel Disease

- Usually Adults
- Weight loss, grinding teeth
- Tarry stools or diarrhea
- Elevated lipase, amylase, globulins
- Slightly reddened or thickened bowel
- Lymph node enlargement

Inflammatory Bowel Disease

- Dietary intolerance or indiscretion
- Parasitism
- Bacterial overgrowth
- Metabolic derangements
- Viral
- idiopathic.

Inflammatory Bowel Disease

- Varying degrees of lymphoplasmacytic or eosinophilic inflammation
- Crypt hyperplasia
- Villous fusion or atrophy
- Crypt abscesses
- Stomach, small intestine, colon

Inflammatory Bowel Disease

- Portal lymphocytic hepatitis
- Periductal lymphocytic pancreatitis
- Lymph node hyperplasia
 - Atypia
 - Edema
 - Lymphoma?

Eosinophilic Disease

- Should not be confused with eosinophilic gastroenteritis
- Idiopathic
- Eosinophilic lymphangitis
- Eosinophilic granulomas
 - Mesenteric lymph nodes
 - Liver
 - Lung

Proliferative Ileitis

- *Lawsonia intracellulare*
- Not common
- Usually young ferrets
- Proliferative crypt and glandular epithelium
- Bacteria in apical cytoplasm of enterocytes
 - Warthin Starry stain

Hepatic Disease

- Lipidosis
- Vacuolar degeneration
- Portal hepatitis
- Septic hepatitis/abscesses
- Cirrhosis
- Cholelithiasis
- Biliary cysts
- Hepatocellular carcinomas, adenomas (hepatomas)

Hepatic Lipidosis

- Common,
- almost always something else wrong
- anorexia, obesity
- endocrine or metabolic disease
- hypoxia, hepatotoxins
- variable morbidity, icterus

Portal Hepatitis

- Very common
- Ascending inflammatory processes of biliary tree
- Immune mediated?
- Usually seen in conjunction with inflammatory changes in gut, esp IBD
- +/- clinical morbidity or enzyme elevations
 - ALT, alk phos, GGT

Cirrhosis

- end stage liver disease
- chronicity of lesions makes interpretation of underlying cause/es difficult or impossible
- aging
- toxins
- biliary obstruction
- end result of portal hepatitis, hepatic lipidosis or steroid hepatopathy

Cystic Biliary Lesions

- very common in mustelids, esp domestic and black footed ferrets
- usually benign cysts or cystadenomas
- can become very large
- rarely rupture, bile peritonitis
- rarely malignant

Hepatocellular Tumors

- proliferative hepatocellular lesions somewhat common
- aging, previous or ongoing hepatocellular insults
- nodular hyperplasia, adenoma (hepatoma), hepatocellular carcinoma
- all have similar gross appearance

Splenic Diseases

- Extramedullary hematopoiesis
- Hematoma
- Hemangiosarcoma
- Lymphoma
- Lymphofollicular hyperplasia

Extramedullary Hematopoiesis

- very common in adult ferrets
- cause not known
 - Aging, hormonal derangements, antigenic stimulation from gut, compensation for anemia or inflammation
- mechanical displacement of viscera
- can disrupt sinusoids, hematoma, rupture

Hematoma

- trauma
- sinusoidal disruption due to EMH or lymphoid hyperplasia
- underlying neoplasia
- can rupture
- usually solitary, but difficult to distinguish grossly from neoplasia

Vascular Neoplasia

- Vascular neoplasms occasionally seen in ferrets, spleen, liver, skin
- Splenic and hepatic tumors usually malignant, skin tumors usually benign
- Visceral hemangiosarcoma readily metastasize, coagulopathies, hemoabdomen

Ectopic Spleen

- Usually small solitary nodules
- Omentum, pancreas, liver
- incidental
- Can be confused with metastatic hemangiosarcoma, islet cell tumor

Cardiomyopathy

- idiopathic
 - Hypertrophic
 - Dilatative
 - Degenerative
- passive congestion
 - abdominal and thoracic serosanguinous effusions
 - modified transudate

Renal Disease

- Not much in domestic ferrets
- Glomerulonephritis (aleutian disease?)
- End stage nephritis
- Amyloidosis (black footed ferrets)
- cysts

Common Skin Tumors

- mast cell tumors
- sebaceous cell tumors

- apocrine gland tumors
- hemangioma
- leiomyosarcoma
- vaccine associated fibrosarcoma
- Mammary and preputial tumors

Lymphoma

- Broad spectrum of presentations
- Lymph nodes
- Viscera
- Skin
- Young and old animals
- Low grade and high grade forms

Thymoma

- Not commonly reported
- Seen occasionally
- Usually the epithelial cell component
- Confused clinical with mediastinal lymphoma.

Multiple Myeloma

- +/- hypergammaglobulinemia
- Multicentric in bone
- Occasional skin and visceral involvement.

Chordoma

- Ferret probably most common sp for these tumors
- Notochord origin (embryonic disc)
- Usually tail tip, less common elsewhere
- Benign or slow to metastasize

Osteoma

- Benign bone tumor
- Perhaps most common species for this tumor
- Flat bones of skull

Osteosarcoma

- Usually long bones
- Rarely other bones
- Very rarely extramedullary

Distemper

- Canine distemper virus
- Upper and lower respiratory disease
- Lymphoid tissues affected
- Skin
- immunosuppressive
- Vaccine

Aleutian Disease

- Parvovirus, more severe in mink than ferrets
- Counterimmuno-electrophoresis, FA antibody
- Hypergammaglobulinemia
- Wasting +/- CNS
- Systemic plasmacytic lymphocytic inflammation
- Membranoproliferative Glomerulonephritis

Mycobacteriosis

- Somewhat uncommon
- Intestine and mesenteric lymph nodes
- Ears, skin, brain
- At least two forms
 - *M. avium*-like
 - Atypical mycobacteriosis

FIP?

- ferrets have a granulomatous disease that is indistinguishable from dry form of FIP
- immunohistochemistry for FIP cross reacts with antigen in ferret lesion
- enteric coronavirus variant as seen in cats?

Head Tilt

- encephalitis
 - distemper, aleutian disease, bacteria, cryptococcus
- neoplasia
 - External ear canal
 - Brain
 - Nasal cavity
 - Facial soft tissues
- otitis media/interna
 - Bacteria, mycobacteria, mites, aspergillosis