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
- megasophagus
- foreign bodies
- helicobacter
- stress
- inflammatory bowel disease
- enteric coronavirus
- Proliferative ileitis
- mycobacteria

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

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

Megasophagus
- 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 reddenex 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 intracellularare*
- 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 underly 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
- Counterimmunoelectrophoresis, 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