hey, buddy - be a good helper and hold this for me for a while.

OTAY!

I'm helping!

BIG HELPER!

I'm a good helper.
OUTLINE

Normal anatomy & function

Hepatobiliary injury and responses

Manifestations of hepatic failure

Developmental anomalies and miscellaneous lesions

Circulatory disturbances

Metabolic & nutritional disturbances

Infectious diseases of the liver (hepatitis)

Toxin-induced liver diseases

Diseases of uncertain cause

Proliferative lesions of the liver

Diseases of the gallbladder and bile ducts
DISEASES OF UNCERTAIN ORIGIN

- Equine serum hepatitis
- Canine chronic hepatitis
Equine Serum Hepatitis (Theiler’s Disease)

- Typically occurs 1-2 months after injection with a biological of equine serum
- Etiology has long been unknown
  - Now thought to be a Flavivirus (pegivirus)
- Clinical signs - Jaundice and encephalopathy

**Gross**
- Small, flabby and pale liver
DISEASES OF UNCERTAIN ORIGIN

Equine Serum Hepatitis (Theiler’s Disease)

Histology:
- Centrilobular to massive necrosis
- Fatty degeneration
- Cholestasis
- Mononuclear infiltration
- Slight fibrosis and regeneration

www.askjpc.org/vspo/show_page.php?id=134
Chronic-active hepatitis
• Descriptive term

Etiology:
• **Idiopathic**
  • Copper associated (36%)
  • Leptospirosis
  • Infectious Canine Hepatitis
  • Progression from acute hepatitis
  • Therapeutic drugs
  • Immune-mediated
  • Toxic injury
Canine Chronic Hepatitis

• Clinical features
  – Anorexia, lethargy, weakness, vomiting, diarrhea, weight loss
  – Icterus, coagulopathies, ascites, hepatic encephalopathy
  – Elevated liver enzymes, ↓ albumin
• Gross
  – Small liver, coarsely nodular
Canine Chronic Hepatitis

**DISEASES OF UNCERTAIN ORIGIN**

**Histology**
- Portal + periportal mononuclear inflammatory cells
- **Piecemeal necrosis** ("interface hepatitis")
- Intrahepatic cholestasis
- Bridging fibrosis
- Regenerative nodules

Limiting plate
PROLIFICATIVE LESIONS OF THE LIVER

Non neoplastic

- Hepatocellular nodular hyperplasia
- Regenerative nodules
- Biliary hyperplasia

Neoplastic

- Benign
- Malignant
  - Primary
  - Metastatic

Hepatocellular nodular hyperplasia, dog

Cholangiocellular carcinoma, dog
Non-neoplastic Proliferations

Nodular Hyperplasia

- Common in aged dogs
- Single or multiple, yellow to tan, < 3 cm, well delineated nodules
- Histology
  - Disorganized plates of hepatocytes
  - Portal triads are present
  - Lobular pattern is preserved but a little distorted

Images: PBVD, Zachary 2017
Non-neoplastic Proliferations

• Surrounded by fibrous tissue*
• Necrosis and inflammation are common
• Typically involves the entire organ
Non-neoplastic Proliferations

- Bile duct proliferation

- Non-specific response to biliary or hepatocellular damage
- Often no gross findings unless severe
- Accompanied by fibrosis
Neoplastic Diseases of the Liver

Primary liver tumors arise from:
- Hepatocytes*
- Bile ducts*
- Gall bladder
- Mesenchymal tissue
- Neuroendocrine system

- Neoplasia in the liver can cause single or multiple masses or diffuse hepatomegaly
- Neoplasia causes increased liver size
- Cirrhosis causes decreased liver size
PROLIFERATIVE LESIONS OF THE LIVER

Hepatocellular Tumours

Hepatocellular adenoma

- Dogs and young ruminants
- Not easy to differentiate from nodular hyperplasia in old dogs

Gross
- Single, unencapsulated, red-brown, nodular, +/- pedunculated

Histology
- Well differentiated hepatocytes
- No portal tracts

http://w3.vet.cornell.edu/nst/nst.asp
**Histology**
- Cells in trabecular pattern
- Well-differentiated or anaplastic

**Gross**
- Often solitary, can involve the whole lobe
- Multilobulated, grey-white to yellow-brown

**Hepatocellular Tumours**

**Hepatocellular carcinoma**
- Dogs
- Must differentiate from adenoma
Cholangiocellular Tumours

- Cholangiocellular adenoma
  - Often cystic
  - Common in cats
  - May be multiple
  - Ductal plate malformations
Cholangiocellular tumours

Cholangiocellular carcinoma, dog

Cholangiocellular carcinoma

- Relatively common
- Multilobulated, firm, central areas of depression/necrosis (umbilicated)
- Often metastasize within the liver
Many malignant tumors in the liver are metastases from other organs.
PROLIFERATIVE LESIONS OF THE LIVER

Other Tumours

- Histiocytic sarcoma, dog
- Lymphoma, pig
- Lymphoma, cat

From Noah’s arkive
**Gallbladder**
- Stores, concentrates and releases bile via the cystic duct

**Hepatic bile ducts**
- Carry bile from different lobules of the liver

**Common bile duct**
- Carry bile to intestine

**Bile** = Water, Cholesterol, Bile acids, Bilirubin, Inorganic ions

**Secretion provides:**
1. Bile acids for digestion of dietary fats
2. Excretory route for various metabolites and drugs
3. Buffers that neutralize acid pH from the stomach
Gallbladder Stones (Choleliths)

- Gallstones are made of:
  - Cholesterol, bile pigments, bile salts, calcium and proteinaceous matrix
  - Supersaturation and precipitation of bile
- Secondary to ascending bacterial infections?
**Gallbladder Stones (Choleliths)**

- Not significant until obstruction occurs
- Icterus, hepatic atrophy, biliary fibrosis
- Fasting / Anorexia*
- Secondary to biliary obstruction
- *Lantana camara* toxicosis
  - Cholestasis, icterus and photosensitization

**Gallbladder Distension**

Gallbladder distension, sheep, *Lantana camara* toxicosis

Gallbladder distension (left) and normal GB (right) sheep

*UNAM-FMVZ PATOLOGIA*
Cystic Mucinous Hyperplasia

- Cystic proliferation of the mucus-producing glands of the gallbladder and bile ducts
- Old dogs and sheep
- Cause is unknown
- Often associated with GB murocele*
Gallbladder dilation
Accumulation of mucoid secretion
Small breed dogs – Shelties, Cocker spaniels
Cause?
- Decreased gall bladder motility
- Abnormal bile composition
- Bile stasis
- Cystic mucinous hyperplasia
Sequelae
- Extrahepatic biliary obstruction
- Ischemic necrosis and rupture
Rupture of the Biliary Tract / Gallbladder

- Usually traumatic in origin
- Steady leakage of bile into the peritoneal cavity
- Chemical peritonitis
- May be sterile or infected with enteric bacteria → rapidly fatal
THE BILIARY TRACT – DISEASES

Gallbladder Edema

- CAV-1 infection (ICH) in dogs
- *Salmonella* and Rift valley fever in cattle
- Aflatoxicosis and mulberry heart in pigs
- Congestive heart failure and DIC
Cholecystitis

- Inflammation of gallbladder
- Acute or chronic
- Fibrinous cholecystitis
  - Salmonellosis in cattle*
  - Hemorrhagic cholecystitis
  - Salmonellosis in cattle*
  - Arsenic toxicosis
Inflammation of the bile ducts
  - Can extend into the liver (cholangiohepatitis)

Portal of entry for bacterial agents:
  - Ascending from the intestine
  - Hematogenous

Two important entities in companion animals:
  - Suppurative cholangiohepatitis
  - Lymphocytic cholangitis

**Suppurative cholangitis**
- Older cats > dogs
- Ascending bacterial infection
- Often associated with IBD or pancreatitis in cats
Lymphocytic Cholangitis – Feline progressive lymphocytic cholangiohepatitis

- Common in older cats
- Lymphoplasmacytic portal inflammation – may center on the bile ducts
- Slow progression to portal fibrosis/biliary hyperplasia – May become icteric
- Immune mediated disorder?
- Severe cases can look like lymphoma
Gallbladder Neoplasia

- Very rare in animals
- Adenomas (cattle)
- Carcinoma