# Bile acids algorithm

### **Use results to:**



**Assess** liver function



**Identify** occult liver disease



**Evaluate** for vascular anomalies



**Monitor** patients on hepatotoxic medication

# Clinical signs and diagnostic findings consistent with hepatobiliary disease

#### Clinical signs

Breed predilection

Poor growth in young animal

Poor recovery from anesthesia/sedation

Neurologic signs

History of hepatotoxic medication

Weight loss

Anorexia/vomiting/diarrhea

Ascites Icterus\*

#### CBC

Decreased and/or low normal MCV

# **Chemistry panel**

Decreased or low normal:

- BUN
- Albumin
- Glucose
- Cholesterol

#### Urinalysis

Ammonium biurate crystals

Bilirubin (feline)

#### Increased:

- ALT, AST, GGT, ALKP (persistent elevation or ≥ 3x upper end of reference interval)
- Total bilirubin\*

# 2 or more of the above clinical indicators?

Consider extrahepatic diseases where appropriate; perform pre- and postprandial bile acids\*

\*If patient is icteric or if bilirubin is increased, rule out prehepatic causes and proceed without bile acids testing (see reverse side).

#### **Normal**

#### Canine

Preprandial:  $0-14.9 \mu mol/L$ Postprandial:  $0-29.9 \mu mol/L$ 

#### Feline

Preprandial:  $0-6.9 \mu mol/L$ Postprandial:  $0-14.9 \mu mol/L$ 

Does not rule out the presence of

hepatobiliary disease

#### **Mild elevation**

#### Canine

Pre- or postprandial: 30.0–40.0  $\mu$ mol/L

#### Feline

Pre- or postprandial: 15.0–30.0 μmol/L

Can be seen with both extrahepatic and hepatobiliary disease

# Moderate to severe elevation

### Canine

Pre- or postprandial:  $>40.0 \,\mu\text{mol/L}$ 

#### **Feline**

Pre- or postprandial:  $>30.0 \,\mu\text{mol/L}$ 

Consistent with hepatic dysfunction and/or cholestatic liver disease

# Rule out extrahepatic causes

Consider supportive care and reevaluate as appropriate

Continued suspicion of primary hepatobiliary disease?

Investigate for underlying hepatobiliary disease

See reverse side for steps to identify/rule out possible causes of increased bile acids





# Increased bile acids and/or hepatic enzymes?

# **Evaluate for extrahepatic diseases**



#### Possible causes

- Pancreatitis
- Gastrointestinal disease
- Endocrine
- Hyperadrenocorticism
- Hyperthyroidism
- Diabetes mellitus
- Extrahepatic neoplasia
- Hypoperfusion (congestive heart failure, shock)
- Trauma
- Drug induced (ALKP/GGT)
- steroids, phenobarbital
- Muscular disease (ALT/AST)
- Osteolytic disease/bone (ALKP)



## **Consider performing**

- Spec cPL® Test/Spec fPL® Test
- Diagnostic imaging
- Endocrine testing

# **Investigate underlying hepatobiliary disease**



### Possible causes

- Inflammation (chronic hepatitis, cholangiohepatitis)
- Infection (leptospirosis, bacterial cholangiohepatitis)
- Toxicity (NSAID, phenobarbital, sago palm)
- Vascular anomaly (portosystemic shunt, microvascular dysplasia)
- Neoplasia (primary or metastatic)
- Cholestatic liver disease
  - Lipidosis
  - Vacuolar hepatopathy
- Cirrhosis
- · Biliary disease
  - Mucocele
  - Cholelith
  - Biliary neoplasia
  - Cholecystitis
- Breed-related increase (Maltese)



## **Consider performing**

- Coagulation profile (PT/aPTT)
- Ammonia
- · Diagnostic imaging
- Cytology
- Biopsy
  - Special testing as indicated (liver copper concentrations, liver culture)
- Infectious disease testing

