ICTERUS IN DOGS

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ICTERUS OBSERVED

Evaluate PCV and/or HCT

Patient anemic?

YES

Evaluate reticulocyte count

Regenerative anemia?

YES

LOCALIZATION
Prehepatic icterus

Anemia significant?

YES

Conduct further diagnostic investigation of anemia

See Immune-mediated disease suspected box, next page

NO

Recheck PCV and HCT in 1 to 2 days

Anemia progressive?

YES

Recheck reticulocyte count in 2 days

NO

See Conduct serum chemistry profile box

NO

Recheck PCV and/or HCT to rule out developing anemia

HCT = hematocrit
PCV = packed cell volume

YES

Bilirubinuria present?

YES

Perform urinalysis

NO

True icterus unlikely

NO

See Liver enzymes elevated box, page 19

NO

Perform urinalysis

Bilirubinuria present?

YES

Perform urinalysis

NO

Recheck PCV and/or HCT to rule out developing anemia

Patient anemic?

See Liver enzymes elevated box, page 19

NO

Perform urinalysis

Bilirubinuria present?

YES

Perform urinalysis

NO

Recheck PCV and/or HCT to rule out developing anemia

Patient anemic?

See Liver enzymes elevated box, page 19

NO

Perform urinalysis

Bilirubinuria present?

YES

Perform urinalysis

NO

Recheck PCV and/or HCT to rule out developing anemia

Patient anemic?

See Liver enzymes elevated box, page 19

NO

Perform urinalysis

Bilirubinuria present?

YES

Perform urinalysis

NO

Recheck PCV and/or HCT to rule out developing anemia

Patient anemic?

See Liver enzymes elevated box, page 19

NO

Perform urinalysis

Bilirubinuria present?

YES

Perform urinalysis

NO

Recheck PCV and/or HCT to rule out developing anemia

Patient anemic?

See Liver enzymes elevated box, page 19

NO

Perform urinalysis

Bilirubinuria present?

YES

Perform urinalysis

NO

Recheck PCV and/or HCT to rule out developing anemia

Patient anemic?

See Liver enzymes elevated box, page 19

NO

Perform urinalysis

Bilirubinuria present?

YES

Perform urinalysis

NO

Recheck PCV and/or HCT to rule out developing anemia

Patient anemic?

See Liver enzymes elevated box, page 19

NO

Perform urinalysis

Bilirubinuria present?

YES

Perform urinalysis

NO

Recheck PCV and/or HCT to rule out developing anemia

Patient anemic?

See Liver enzymes elevated box, page 19

NO

Perform urinalysis

Bilirubinuria present?

YES

Perform urinalysis

NO

Recheck PCV and/or HCT to rule out developing anemia

Patient anemic?

See Liver enzymes elevated box, page 19

NO

Perform urinalysis

Bilirubinuria present?

YES

Perform urinalysis

NO

Recheck PCV and/or HCT to rule out developing anemia

Patient anemic?

See Liver enzymes elevated box, page 19

NO

Perform urinalysis

Bilirubinuria present?

YES

Perform urinalysis

NO

Recheck PCV and/or HCT to rule out developing anemia

Patient anemic?

See Liver enzymes elevated box, page 19

NO

Perform urinalysis

Bilirubinuria present?

YES

Perform urinalysis

NO

Recheck PCV and/or HCT to rule out developing anemia

Patient anemic?

See Liver enzymes elevated box, page 19

NO

Perform urinalysis

Bilirubinuria present?

YES

Perform urinalysis

NO

Recheck PCV and/or HCT to rule out developing anemia

Patient anemic?

See Liver enzymes elevated box, page 19

NO

Perform urinalysis

Bilirubinuria present?

YES

Perform urinalysis

NO

Recheck PCV and/or HCT to rule out developing anemia

Patient anemic?

See Liver enzymes elevated box, page 19

NO

Perform urinalysis

Bilirubinuria present?

YES

Perform urinalysis

NO

Recheck PCV and/or HCT to rule out developing anemia

Patient anemic?

See Liver enzymes elevated box, page 19

NO

Perform urinalysis

Bilirubinuria present?

YES

Perform urinalysis

NO

Recheck PCV and/or HCT to rule out developing anemia

Patient anemic?

See Liver enzymes elevated box, page 19

NO

Perform urinalysis

Bilirubinuria present?

YES

Perform urinalysis

NO

Recheck PCV and/or HCT to rule out developing anemia

Patient anemic?
Evidence of immune-mediated disease (eg, autoagglutination, spherocytes, positive Coombs test result)?

**IMMUNE-MEDIATED DISEASE SUSPECTED**

If yes:

- **DIAGNOSIS**
  - IMHA
  - Evidence of underlying disease?
    - Consider recent vaccinations, infectious disease, neoplasia

If yes:

- **DIAGNOSIS**
  - Secondary IMHA
  - Treatment and/or management of underlying disease

If no:

- **DIAGNOSIS**
  - Primary (idiopathic) IMHA
  - Treatment: Immunosuppressive therapy, Other supportive medications

If no:

- Possible nonimmune-mediated causes of hemolytic anemia (eg, toxins, infectious disease, enzymopathies)?

If yes:

- Conduct further diagnostic investigation
  - Abdominal radiography to rule out zinc foreign body
  - Infectious disease testing, particularly serologic or PCR testing for babesiosis
  - Genetic testing for congenital enzymopathies (eg, pyruvate kinase deficiency, phosphofructokinase deficiency)

If no:

- **DIAGNOSIS**
  - Secondary IMHA
  - Treatment and/or management of underlying disease

ALP = alkaline phosphatase
ALT = alanine aminotransferase
GGT = gamma-glutamyl transpeptidase
IMHA = immune-mediated hemolytic anemia
Serum chemistry indicators of liver failure (e.g., hypoalbuminemia, hypoglycemia, hypocholesterolemia, low BUN)?

**LIVER ENZYMES ELEVATED**

- Serum chemistry indicators of liver failure (e.g., hypoalbuminemia, hypoglycemia, hypocholesterolemia, low BUN)?
  - **YES**
    - **DIAGNOSIS**
      - Suspected hepatocellular failure
  - **NO**
    - Other serum chemistry indicators of cholestasis**  (e.g., hypocholesterolemia, elevated GGT)?
      - **YES**
        - **LOCALIZATION**
          - Suspected extrahepatic cause of icterus
          - Conduct further diagnostic investigation for extrahepatic cholestasis:
            - Ultrasonography
            - Biliary aspiration
            - Surgical exploration to evaluate hepatobiliary tract
            - Liver biopsy
      - **NO**
        - **LOCALIZATION**
          - ALP > 2 times ALT value?
            - **YES**
              - Perform abdominal ultrasonography
            - **NO**
              - Evidence of extrahepatic biliary disease (e.g., mucocele, choledolithiasis, bile duct dilatation, gall bladder wall changes)?
                - **YES**
                  - Perform liver biopsy (ultrasound-guided, laparoscopic, or laparotomy)
                - **NO**
                  - Proceed as determined by gross and histopathologic findings

- **ELEVATED**
  - **DIAGNOSIS**
    - Suspected concurrent hepatic encephalopathy
  - **TREATMENT**
    - Antibiotics
    - Lactulose

- **NORMAL**
  - **LOCALIZATION**
    - Suspected intrahepatic cause of icterus
    - Evaluate blood ammonia level*
  - **ELEVATED**
    - **DIAGNOSIS**
      - Suspected concurrent hepatic encephalopathy
  - **TREATMENT**
    - Antibiotics
    - Lactulose
    - Perform coagulation profile

- **NORMAL**
  - **TREATMENT**
    - Administration of plasma
    - Consider toxin exposure and/or infectious disease
    - Check leptospirosis titers

*Clinicians should reference their laboratory's reference range when determining whether a value may be elevated, as reference ranges can vary between laboratories.

**Hypercholesterolemia should only be considered significant if the patient has been fasted for 8 hours prior to sample collection.**