

Evaluation of the Hepatobiliary System

A PowerPage Presented By



The incidence of hepatobiliary disease in horses is relatively low. However, when it does occur, profound clinical signs may be observed because of the multiple functions that the liver serves. This PowerPage will review general information related to the hepatobiliary system in the horse as well as the diagnostic tests utilized to investigate hepatobiliary disease. A discussion of the more common diseases affecting this system can be found at the *Hepatobiliary Diseases PowerPage* and includes a review of Acute Serum Hepatitis (Theiler's Disease), Chronic Active Hepatitis, and Pyrrolizidine Alkaloid Toxicosis.

Key Points

- Clinical signs of hepatobiliary disease may include any combination of the following: weight loss, anorexia, **jaundice**, **photosensitization** and abnormal behavior (**hepatoencephalopathy**)
- Abnormalities associated with equine hepatobiliary disease on serum biochemistry profile include **elevations** in gamma-glutamyl transferase (**GGT**), bilirubin, sorbital dehydrogenase (**SDH**) and alkaline phosphatase (**ALP**)
- Histologic examination of liver samples is necessary to definitively diagnosis the specific type of hepatobiliary disease

Hepatobiliary System

Functions of the hepatobiliary system

- The liver is necessary to maintain many important homeostatic functions including production of various proteins and processing of numerous metabolic pathways. Key functions of the liver include:
 - Detoxification and processing of portal blood received from the GI tract
 - Synthesis of proteins and clotting factors
 - Metabolic processes such as gluconeogenesis, fat metabolism, bile production, glycogen storage, urea production, ketogenesis
 - Digestive functions – Bile production (dietary fat digestion), bicarbonate production (neutralization of gastric pH)
 - Remember that horses do not have a gall bladder

Diagnostic evaluation of the hepatobiliary system

- Hepatobiliary disease in the horse can be detected based on clinical signs but a significant portion (75-80%) of the liver must be involved before clinical signs are manifested. Clinicopathologic data can be used to detect hepatobiliary disease earlier. Therefore, it is important for you to be familiar with the enzymes associated with hepatobiliary disease in the horse. These include:
 - Gamma-Glutamyltransferase (GGT) – Increased with biliary and peri-portal insult/disease; ***liver specific*** in serum samples
 - Alkaline Phosphatase (ALP) – Found in liver, bone and intestines; commonly associated with peri-portal and biliary injury/disease
 - Sorbital Dehydrogenase (SDH) – ***Liver specific***; hepatocellular enzyme; SDH has short ½ life and reflects **acute injury**

- Aspartate aminotransferase (AST) – Primarily found in liver and muscle. Evaluate CK concurrently to help differentiate source
- Bilirubin– A product of RBC metabolism and is eliminated by the liver. Elevations in bilirubin **can occur from hemolysis or from liver disease**
- Serum Bile Acids – Liver specific assay to help detect liver involvement. Unlike other species, only a single sample is necessary (i.e. no need for pre- and post-prandial samples)
- Elevated Ammonia – Failure of conversion of ammonia to urea in the liver may cause elevations in ammonia
- Decreased Urea Nitrogen – Failure of conversion of ammonia to urea by the liver may cause decreased BUN
- Increased clotting times – Liver produces several clotting proteins such as factors II, V, VII, IX, X
- Definitive diagnosis of hepatobiliary disease is based on microscopic examination of the liver
- The liver is easily visualized with ultrasonography (Figure 1), especially on the **right side** of the horse. Liver biopsies can be acquired from the right side, just caudal to the lungs, using ultrasound as a guide

Figure 1: Ultra-sonographic image of the liver as imaged from the right side



Clinical Signs of Hepatobiliary Dysfunction

Clinical signs associated with hepatobiliary disease in the horse do not necessarily tell you the specific form of liver disease; rather, clinical signs are suggestive of hepatobiliary disease. Definitive diagnosis is **based on histologic examination of liver samples** either collected via biopsy or post-mortem.

Clinical signs suggestive of hepatobiliary disease include:

- Weight loss
- Anorexia/inappetance
- **Jaundiced sclera and mucous membranes** (Figure 2)
- **Photosensitization** (Figure 3)
- Abnormal behavior (lethargy or excitement-aggression)
 - Manifestation of **hepatoencephalopathy** (Figure 4)



Figure 2: Photograph of a horse with acute serum hepatitis. Notice the distinct icterus of the sclera of the left eye



Figure 3: Photograph of a horse with photo-sensitization. Notice the distinct irritation of the white portions of the muzzle



Figure 4: Photograph of a horse with severe hepatic failure demonstrating signs of hepatoencephalopathy

