

Liver function test

The liver has many vital physiologic functions involving synthesis, excretion, and storage. When a disease process damages cells within a liver changes in hepatic function may alter the composition of body fluids, and the resulting abnormality may be detected by laboratory assay .

Normal liver function include:-

1. Secretion and excretion of bile.
2. Protein metabolism.
3. Carbohydrate metabolism.
4. Fat metabolism.
5. Detoxification.
6. Production or formation of plasma protein and clotting factors and heparin.
7. Storage of iron and copper.
8. Storage and production of vitamin A.

Important of liver function tests:-

Hepatic function tests may be used to

1. Differentiate types of jaundice.
2. Establish the presence or absence of disease.
3. Attempt to determine, whether a disease process is remaining static, progressing or regressing.

Limitations of liver function tests

Specific criticisms that have been leveled against liver function tests include:

1. Extensive damage is required before tests show impaired function because of the great reserve power of the liver.
2. The tests are lacking sensitivity.
3. There are so many functions of the liver that testing one does not indicate the functional status of the entire organ.
4. Specific hepatic functions are greatly affected by a wide variety of pathologic conditions of extrahepatic origin.

Classification of liver function tests

All liver function tests may be classified according to the type of hepatic function examined. Liver function tests may be categorized as follows:

1. Tests dependent primarily on hepatic secretion and excretion.
 - a. Bile pigments.
 - b. Clearance of foreign substances.
2. Tests dependent upon specific biochemical functions.
 - a. Protein metabolism tests.
 - b. Carbohydrate metabolism tests.
 - c. Lipid metabolism tests.
3. Tests dependent upon the measurement of serum enzyme activity.
 - a. Transaminases
 - b. Alkaline phosphatase
 - c. Other enzymes

Tests based on hepatic secretion and excretion

Bile pigments

Serum bilirubin

The chief bile pigment found in the serum of domestic animals is bilirubin. Bilirubin is derived from hemoglobin. Bilirubin may exist in two form as a protein bound substance in plasma and as a conjugate known as bilirubin glucuronide. The determination of total bilirubin and conjugated bilirubin in serum is based on the van den bergh reaction. This test is based on the ability of bilirubin to couple with diazobenzosulfochloride (dialzo reagent) to form a characteristic red violet pigment. Since unconjugated bilirubin is insoluble in water and the dialzo reagent is in an aqueous solution the detection of unconjugated bilirubin requires the use of a substance in which both bilirubin and the dialzo reagent are mutually soluble e.g. alcohol. The reaction requiring the addition of alcohol to the serum reagent mixture is termed the indirect reaction and is a specific test for unconjugated bilirubin. The addition of alcohol is not required for coupling of the conjugated bilirubin to the dialzo reagent since the are both soluble in water. This constitutes the direct reaction.

Type of reaction

- 1- Direct reaction
- 2- Indirect reaction

Type of jaundice

- Obstructive
- Hemolytic

Bile pigment in urin

Urinary urobilinogen

The pigments are produced by bacterial reduction of bilirubin conjugates in the intestine. The remaining portion of this pigment is present in the feces as stercobilin. A small portion of the urobilinogen reabsorbed from the intestine passes unchanged through the liver and enters the general circulation where it is excreted via urine. The presence of urobilinogen in urine signifies that the bile duct is open. The absence of this pigment from urine at a single sampling does not necessarily reflect complete closure of the bile duct. Urobilinogen decrease in decrease bacteria action in intestine, and in diuresis. Increase urobilinogen in hemolytic or hepatic disease.

Fecal bile pigments

- Increased amounts (feces usually dark orange in color). It appears in hemolytic jaundice.
- Decreased amount induce clay colored feces it mean total biliary obstruction.

Clearance of foreign dyes from the serum

The clearance of a foreign dye from the serum following parenteral injection is a measure of both biochemical integrity and blood flow in the liver. Delay in removal of such a dye from the blood may be an indication of hepatic necrosis or fibrosis, reduced hepatic blood flow. Dyes that have been used in veterinary medicine include sulfobromophthalein (Bromsulphalein) (BSP), rose Bengal, and indocyanine green (ICG).

Sulfobromophthalein (BSP)

The BSP clearance test is widely used index of hepatic function in domestic animals. The technique for BSP clearance in the dog is as follows

1. Weigh the dog and divide the weight in pounds by 22. This will provide the number of milliliters of BSP solution to be injected.
2. Inject the dye solution intravenously being careful to avoid perivascular infiltration.
3. Thirty minutes after injection remove 5 ml of blood using heparin as the anticoagulant. This sample should be removed from a vein other than the one in which the injection.
4. Centrifuge the blood and place 0.5 ml of unhemolyzed plasma into each of two cuvettes.
5. Add 2.5 ml of distilled water to each tube
6. Add 3 ml of 0.1 N NaOH to one tube to produce maximum BSP color. Add 3 ml of 0.1 N HCL to the other tube.
7. Read the tube containing NaOH against the tube containing HCL at 555m μ on a standard curve.

Interpretation of BSP clearance in domestic animals

In dog less than 5 percent retention at 30 minutes normal. However up to 10 percent retention at 30 minutes hepatic damage. hepatic necrosis , hepatic fibrosis

Test for protein synthesis is:

1. Serum albumin.
2. Serum bilirubin
3. Serum prothrombin.

Test for hepatocellular disease :

1. Enzymology ALT (most specific in liver).
2. AST (less specific)
3. GGT increase
4. Serum urea decrease in both acute and chronic hepatic disease.