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Liver Function Tests in Animals

Authors

Subrat Kumar Dash

Assistant Professor-cum-Jr Scientist
(Veterinary Biochemistry), Department of Veterinary Biochemistry, College of Veterinary Science and Animal Husbandry, Birsa Agricultural University
Ranchi, Jharkhand, India.

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INTRODUCTION

Liver function test are used to asses the hepatic function. Clinical manifestation of hepatic disease are directly attributable to alteration in the metabolic, excretory synthetic and digestive functions of the liver. Signs of hepatic insufficiency include Ictrus, Ascites, hepatic encephalopathy and particularly in cow is hepatic photosensitivity. These signs are attributable to various causes like infections caused by bacteria virus or parasites. Toxic substances, heavy metals, cholestasis, hemolytic diseases. The liver has great functional reserve, and the sign of the hepatic failure often do not develop until 70 % or more of functional capacity is lost. And also possibly because of the unique regenerative capacity of liver.

Tests:

Various test have been employed to assess the pathophysiology of liver which includes

1. Estimation of Serum Total, direct & Indirect bilirubin.
2. Estimation of Serum total protein, Albumin ,globulin, fibrinogen
3. Estimation of level of plasma enzymes like ALT, AST, ALP, GGT
4. BSP & ICG Dye Excretion method
5. Measurement of blood clotting time, Prothombin time

Commonly used parameters for assessment of liver function in animals are as follows-

1. **ALT is the most sensitive marker for liver cell damage**; since it is only synthesized by liver cells but other liver enzymes may be also synthesized by other organs.
    - Used sample: serum or plasma
2. **AST (Aspartate aminotransferase)**
    - **synthesized by:** liver cells, cardiac muscle and skeletal muscles.
    - This enzyme also reflects damage of the hepatic cell but less sensitive than ALT, since it is synthesized by other organs. The ALT/AST ratio is useful in assessing the etiology of liver enzyme abnormalities.
    - **High serum AST due to:**
      Muscle damage, myocardial infarction (heart attack) and in chronic liver disease. To confirm that high AST is due to heart or muscle injury; another enzyme (creatinine kinase CK) which is specific for heart is also tested
    - Used sample: serum or plasma

Fasting is preferred but not required for this test.

3. **ALP (alkaline phosphatase)**

- It is found high in liver, bile ducts and bone.
- It is **not specific for bile** because it is synthesized also by bone and placenta (isoenzymes).
- **High serum ALP may be due to:**

Bile duct damage, inflammation, cirrhosis or obstruction due to stones,Alcoholic hepatitis.

- **Normal physiological elevation:** During pregnancy,During child growth
- **To assess the etiology of ALP elevation**, GGT and bilirubin levels are also measured.
- **Used sample:** serum or plasma

Fasting is preferred but not required for this test.

4. **GGT (Gamma Glutamyl transferse)**

- Produced by liver, kidney and pancreas.
- Its level is elevated in toxins and alcoholic hepatitis.
- It is used to confirm hepatic etiology of ALP elevation.
- GGT is not helpful test in distinguishing between the different causes of liver damage

- **Used sample:** serum or plasma

Eight hours fasting is recommended because GGT drops after eating.

5. **Bilirubin**

Bilirubin produced from heme degradation (80% of heme come from RBCs hemoglobin, 20% from other hemo-protein as cytochrome, myoglobin). Bilirubin is transferred to liver to undergo further metabolic process called conjugation to make it more water soluble. Then conjugated bilirubin is excreted in bile to help in food digestion and the excess amount is excreted in urine and stool. Elevated levels of bilirubin in blood and urine indicate certain diseases.

Types of bilirubin in serum:

When serum bilirubin level is measured in lab, it is classified to:

Direct bilirubin: is conjugated or water-soluble bilirubin, in aqueous solution it reacts rapidly with reagent and said to be (direct reacting).

Indirect bilirubin: is unconjugated or water insoluble bilirubin, because it is less soluble in it reacts more slowly with reagent therefore the reaction carried out in the presence of methanol, in this case both conjugated and unconjugated bilirubin are measured given

Total bilirubin: Unconjugated will calculated by subtracting direct from total and so called indirect. Knowing the level of each type of bilirubin has diagnostic importance.

Jaundice: Is a medical term describes the elevation of bilirubin in blood result in yellow color of skin and sclera.