Avian Biochemistry

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The most common analyses are:
- AST – aspartate aminotransferase
- CK - creatine kinase
- Bile acids
- Glucose
- Protein
- Uric acid
- Calcium
- Amylase
- Cholesterol
- Triglycerides
- Lead and zinc

Aspartate aminotransferase

AST will get elevated within days following liver or muscle damage. If both AST and CK are elevated the bird can suffer from liver and/or muscle damage. If only AST is elevated liver damage is indicated.

Severe hemolysis in the serum sample is another reason for high AST.

Aspartate aminotransferase

AST has high sensitivity but lower specificity for it leaks from both liver and muscle when those tissues are damaged.

Creatine kinase

Elevated CK can be a sign of active muscle damage. It has both high specificity and high sensitivity for muscle disease. An elevation of CK can also be due to severe sample hemolysis.

Bile acids

From cholesterol bile acids are synthesized in the liver. Bile acids are released from the gallbladder after a meal. Even in birds without gallbladder there is an increased release after eating.

Elevation in bile acids is a sign of reduced hepatic function. Liver-related enzymes are not as sensitive as bile acids when it comes to detecting reduced hepatic function.
Chronic hepatic damage with persistent loss of liver function may be detected by measuring bile acids. AST will often return to normal after acute insult if there is not continuing damage to hepatocytes with leakage of AST.

Persistant elevation in bile acids is an indication for a hepatic biopsy. A biopsy can give a more specific morphologic or etiologic diagnosis.

Birds have a much higher normal glucose value than mammals.

The main regulatory hormone is glucagon, rather than insulin.

Glucocorticoid hormones may cause hyperglycemia by increased glucose production. Adenergic hormones are glycogenolytic and result in increased glucose release.

Diabetes mellitus is a possible diagnosis when glucose is elevated to very high concentrations (>1000mg/dL).

Granivorous birds can not maintain constant plasma glucose levels as long as carnivorous species.

Very low values are often due to bacterial contamination or samples stored too long before analysed.
Protein

Inflammatory disorders and hemoconcentration due to dehydration can result in absolute and relative elevations of protein.

Protein

Acute blood loss or protein losing enteropathies should cause hypoproteinemia. Starvation may cause hypoproteinemia but homeostasis often maintains plasma protein normal.

Uric acid

Uric acid is synthesized in the kidney, but to a greater extent in the liver. It is filtered by the glomerules and secreted by the proximal tubules. Elevated blood uric acid indicates either extensive proximal tubular damage (renal azotemia) or severe dehydration (prerenal azotemia) in the noncarnivorous bird. Significant elevations of blood uric acid occur after a high-protein meal in carnivorous birds.

Uric acid

Uric acid concentration is not a sensitive renal function test, but it is the best way to assess the renal function in birds. Urea and creatinine are not useful.

Calcium

During ovulations large elevations of calcium can be seen. Neurological signs may be caused with hypocalemia.

Calcium

Malnutrition may be cause hypocalcemia but normal serum values do not rule out disorders in calcium metabolism. Homeostasis can often hold calcium and phosphorus concentrations within normal limits.
**Calcium**

Hypocalcemia is often related to specific nutritional deficiencies. Nutritional imbalance is most commonly due to seed diets. The classic seed mix contains little or no vitamin D3, excess fat, small amounts of calcium, and excess phosphorous giving a low Ca/P ratio in the diet.

**Calcium**

Good-quality sample is needed for calcium analysis. Hemolysis, lipemia, bacterial contamination and unseparated samples adversely affect calcium assays.

**Amylase**

Plasma amylase elevations can be associated with pancreatitis. As in mammals some cases of enteritis may result in amylase elevations. To obtain a specific diagnosis pancreatic biopsy is indicated.

**Cholesterol and triglycerids**

By measuring cholesterol and triglycerids the fat metabolism can be assessed.

Obesity is a common problem for birds that eat too much seeds with excess fat.

**Cholesterol and triglycerids**

Elevated cholesterol levels are associated with hypothyroidism, hepatic lipidosis, high fat diets and starvation, especially in obese birds. But unfortunately there are no clear indicators to determine whether or not an abnormal cholesterol level is associated with a particular condition.

**Lead**

Lead is a toxic heavy metal of no nutritional value. It is absorbed through the intestine into the blood and affects a variety of systems.

Common clinical signs of lead poisoning are neurological signs, vomiting and fatigue.
**Lead**

Whole blood should be collected for hematology and lead analysis. Different laboratories require different sample sizes and some laboratories prefer a particular anticoagulant.

**Zinc**

Zinc is an essential element. It is required for many enzymatic systems but can cause toxicity if the intake is too high. Excess zinc exposure interferes with the normal exocrine function of the pancreas, reduce egg production and initiates moult among other things.

**Zinc**

When zinc toxicosis is suspected radiography, hematology and analysis of whole blood, plasma or serum should be used for diagnosis.

**Good luck!**

Hopefully these comments on avian biochemical analyses helped. Much work still needs to be done to aid in avian diagnosis so keep reading and even think of projects to improve our knowledge.