



# Interpretation of Avian Biochemistry General Guidelines

## Interpretation of Avian Biochemistry:

As interpretation of avian chemistry results differs from mammalian chemistry, a brief explanation of the various tests is included as follows:

### Liver and Muscle

AST and bile acids are the most sensitive indicators of liver disease in birds.

- AST is not liver specific and can be increased in any septic or inflammatory condition, muscle disease and with certain antibiotics and steroids.
- GLDH is present within hepatocyte mitochondria and is considered the most specific indicator for hepatocellular damage in birds.
  - GLDH also has high activity in renal tissue in birds but most of the enzyme is excreted directly into urine and never reaches the blood.
- Serum bile acid concentration is a reliable indicator of liver function.
  - Requires serum as heparin interferes with the assay.
  - Feeding can increase bile acids up to 1.6-4.5 x the normal reference range therefore fasting samples are preferred - pigeons, ostriches and some parrots lack a gall bladder so fasting is not needed in these species.
  - Amazon parrots normally have slightly higher bile acids than other companion avian species.
  - Low bile acid concentrations are common in birds with microhepatita, poor feather formation, and an overgrown malformed beak.
  - **Generally, a bile acid concentration > 100  $\mu\text{mol/l}$  is considered abnormal and > 75  $\mu\text{mol/l}$  is suspicious for hepatic insufficiency.**

CK activity increases with muscle damage and this, along with AST and GLDH, is used to differentiate muscle from liver disease.

The following tests are NOT recommended as indicators of liver disease in birds:

- ALT and GGT occurs in many different tissues and in some species enzyme activity is below the sensitivity of many analysers.
- ALP activity can be increased due to inflammation therefore is considered nonspecific.
- Bilirubin concentrations increase inconsistently in cases of liver disease and some birds (chickens) cannot form bilirubin.



Species:  
Avian, reptile,  
fish and other  
non-mammalian  
species



Specimen:  
Serum or  
plasma (0.4 ml  
minimum, or  
0.3 ml with no  
electrolytes)



Container:  
Lithium heparin  
(preferred) or  
Plain/gel tube



Collection  
Protocol:  
Standard  
venepuncture

## Interpretation of Avian Biochemistry:

---

### Renal

Uric Acid is the most reliable test of renal disease.

- o It requires more serum or plasma than the other tests (a minimum of 50 µl) so is often done last.
- o Age, diet, sex, and recent feeding may affect results especially in raptors where postprandial levels can increase to twice normal for up to 8 hours.
- o Elevations are seen with severe dehydration and renal disease.
- o It can be used as a prognostic indicator for gout - the solubility of uric acid in plasma in birds is around 600 µmol/l - levels higher than this (1500 – 2500 µmol/l) will lead to precipitation in joints.

Urea and creatinine are not useful tests for monitoring for renal disease.

- o Urea can be useful in assessing hydration status - concentrations of 0.4 – 0.7 mmol/l are considered normal, but up to 10-15x increase can be seen in dehydration.
- o Creatinine is not synthesised by birds - most muscle breakdown products are excreted as creatine rather than creatinine.

### Other Tests

**Protein** concentrations in serum are generally lower in birds than mammals.

- o In most avian species levels range between 20-40 g/L (some spp. are as low as 15 g/L).
- o Plasma concentrations will be approximately 1-2 g/l higher than serum concentrations due to the presence of fibrinogen.

**Glucose** is not utilised by avian erythrocytes therefore concentrations in serum are much more stable in birds.

- o Levels will fall slowly over 24-48 hours if the serum stays on the clot.
- o If there is a delay in the sample reaching the laboratory, either spin and separate the sample or use a fluoride oxalate (grey top) tube.
- o Stress and postprandial levels can cause transient increases to 24.9 – 33.3 mmol/l.
- o Conditions such as egg yolk peritonitis and renal carcinoma can also cause similar increases.
- o Borderline hypoglycaemia is common in cockatoos and probably of no clinical significance.
- o ***The glucose reference range in birds (11.2-27.7 mmol/l) is generally higher than in mammals***

**Calcium** measured in serum includes albumin bound and free forms therefore concentration varies with albumin concentration.

- o Oestrogen induces hypercalcaemia therefore calcium concentration in serum increases approximately 4 days prior to ovulation.
- o Corticosteroids decrease total calcium.
- o As in mammals dehydration and some tumours can increase calcium concentrations.
- o African Grey Parrots have a described idiopathic hypocalcaemia (a unique form of hypoparathyroidism in which calcium is not properly released from bone).