Biochemistries

Table 1. Biochemistry parameters in avian patients

Parameter	Elevation	Decrease	Comments
Alanine transaminase (ALT, SGPT)			No value in birds
Albumin		Reduced albumin production or loss of albumin via gut or kidney	As in mammals, albumin is responsible for maintaining osmotic pressure and as a transport protein.
Alkaline phosphatase (ALP)	Physiologic (i.e. increased medullary bone density in the hen) or pathologic bony changes (i.e. fractures, infection, neoplasia)		Not useful in the diagnosis of avian liver disease.
Amylase	A mild elevation is typically associated with gastrointestinal disease, marked elevations (>4x maximum range) are typically associated with pancreatic disease.		Difficult to interpret.
Aspartate aminotransferase (AST, SGOT) *	The last enzyme to rise after muscle or liver damage (72hrs post-damage) and also the last to normalize.		Primary sources are muscle, liver, and kidney. Although not specific for liver, elevations may suggest liver disease.
Bile acid	Elevations indicate liver dysfunction. If a high level is detected, the sample should be repeated. After two high results liver biopsy is indicated, in order to determine the cause of liver dysfunction.		Pre-sampling fasting is required in birds with no gall bladder (e.g. pigeons and parrots).

Table 1. Biochemistry parameters in avian patients—Cont.

Parameter	Elevation	Decrease	Comments
Calcium	Hypercalcemia in psittacine may occur secondary to vitamin D toxicity but elevated calcium levels will also be seen just before egg laying. Polyostotic hyperostosis (increased medullary bone density) may be seen in the shafts of the long bones in laying hens. Hemolysis can cause false elevation, as can lipemia.	Hypocalcaemia is an important cause of seizures in African grey parrots.	As in mammals, total calcium is linked to plasma protein levels. Ionized calcium is more useful, as elevations or declines in total calcium may or may not affect functionally available (ionized) calcium.
Cholesterol	May be associated with starvation, liver disease, hypothyroidism or excessive fatty diet.		Inconsistent significance
Creatine kinase (CK) *	Muscle damage, intramuscular injections, or catabolic states (weight loss due to inanition or disease).		The half-life is approximately 16 hrs.
Globulin	The most common reason is antibody production in egg production, however globuilin levels may also rise with Immunological reaction against infection, inflammation or neoplasia		
Glucose	Stress, starvation after eating, persistent elevation in diabetes.	Sepsis, starvation. A very low sample can also occur if a whole blood sample sits for 24 hours or more due to the presence of nucleated red blood cells.	
Glutamate dehydrogenase (GLDH)	Liver cell damage (elevations can also be consistent with damage to kidney and brain)		The most consistently useful tissue enzyme for liver cell damage.

Table 1. Biochemistry parameters in avian patients—Cont.

Parameter	Elevation	Decrease	Comments
Lactate dehydrogenase (LDH) *			Present in cardiac and skeletal muscle and liver.
Lipase	Acute pancreatitis		
Phosphorus	Chronic renal failure		Inconsistent
Potassium	Renal disease, acidosis, adrenal disease, hemolysis,	Diarrhea, and alkalosis.	
Protein (total)	Dehydration, immune stimulation	Malnutrition, malabsorption, renal disease, liver disease	Should be measured by the biuret method for accuracy, although a temperature compensated refractometer is acceptable if the sample is not lipemic. Best to assess with A/G ratio.
Urea nitrogen	Elevated 4-5X indicates dehydration		Limited value, not an indication of renal function.
Uric acid	Impaired renal function, dehydration, or physiological elevation within 12 hours of feeding in raptors.		The kidney removes 90% of the blood uric acid, and 50% of the kidney must be destroyed to affect blood uric acid levels. Normal levels are not indicative of no renal damage.

✳ If the enzymes CK, AST, and LDH are all elevated this likely indicates muscle damage. Intramuscular injections can cause elevations. If AST and/or LDH are elevated in the absence of CK elevation, this is typically indicative of liver damage, however, relative half-lives of different enzymes should be considered. CK has a short half-life compared with AST, so after muscle injury CK can have returned to normal while AST is still raised. This could be interpreted as being liver derived while in fact it was muscle related. AST is the last enzyme to rise after muscle or liver damage (72hrs post-damage), but also the last to normalize.