

Fructosamine

Interpretive Summary

Description: Fructosamine is a complex of glucose and protein that can be used to assess the average blood glucose concentration in a dog or cat over the previous 2-3 weeks. It is used in the diagnosis and management of diabetes mellitus.

Decreased Fructosamine

Common Causes

- Prolonged hypoglycemia
 - Insulin overdose
 - Insulinoma
- Decreased albumin (dog) or total protein (cat)
- Hyperthyroidism

Uncommon Causes

- Increased serum triglycerides
- Azotemia
- Sample handling – storage at room temperature

Related Findings

- Prolonged hypoglycemia
 - Insulinoma
 - Normal to increased serum insulin with concurrent decreased blood glucose
 - Increased insulin:glucose ratio
 - Pancreatic mass may be seen on ultrasound (cats>dogs)
 - A decreased fructosamine is not diagnostic for insulinoma but can increase clinical suspicion
- Hyperthyroidism
 - Increased T4, free T4 and free T4 by equilibrium dialysis

Increased Fructosamine

Common Causes

- Diabetes Mellitus
- Hemolysis (certain methodologies)
- Insulin overdose with Somogyi rebound effect

Uncommon Causes

- Hypothyroidism
- Increased albumin (dog) or total protein (cat)

Related Findings

- Diabetes Mellitus
 - Increased blood glucose
 - Glucose in urine +/- ketones

Additional Information

Physiology

- Fructosamine correlates with the patient's average blood glucose concentration over the last 2-3 weeks.
 - Fructosamine is not affected by short-term increases in serum glucose such as those that occur with excitement, stress or intravenous dextrose administration.
- Fructosamine is a ketoamine that is formed by an irreversible, nonenzymatic linking of glucose to proteins (most often albumin and IgG).
 - Formation of fructosamine is related to the degree and duration of hyperglycemia.
 - Removal of fructosamine from the blood is dependent on the loss or degradation of the parent molecule (albumin).
- Fructosamine should not be used as the sole indicator of diabetic regulation but should be used in conjunction with clinical history (PU/PD, weight stability, polyphagia) and glucose curves to determine the patient's level of diabetic regulation.
- Because fructosamine is an indicator of the average glucose levels over the prior 2-3 week period, animals with insulin overdose and Somogyi rebound can have an increased, decreased or normal fructosamine value, depending on the relative amount of time spent in the hypoglycemic state versus in the rebound hyperglycemic state.
 - Patients with Somogyi effect will often have clinical signs of poor diabetic regulation (PU/PD, weight loss, polyphagia).
- Interpretation of fructosamine in a diabetic animal must account for the fact that even well controlled diabetics are hyperglycemic at some time points.
 - This will cause the fructosamine to be slightly higher in a well controlled diabetic compared to a non-diabetic patient.

Diagnostic Methodology

- Fructosamine assays depend on the ability of fructosamine to reduce tetrazolium salts to a formazan dye in an alkaline environment.
 - The degree of color produced by the dye is proportional to the amount of fructosamine in the sample.

References

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