

Hypocalcaemia in Cats and Dogs

Hypocalcaemia is diagnosed based on a low total serum calcium concentration. However, a low serum calcium doesn't necessarily indicate that a true hypocalcaemia is present. This is because calcium exists in the blood in three forms, protein bound (predominantly to albumin and to a lesser degree globulin), complexed (with phosphate, bicarbonate, lactate etc) and ionised (or "free"). From a physiological perspective ionised calcium is the important component because it is the one that is metabolically active.

Causes for Hypocalcaemia

Artifact

Low serum calcium is commonly an artifact. A low serum calcium concentration is seen with EDTA contamination of the serum tube, and for this reason it is recommended to collect serum samples before EDTA samples. With EDTA contamination there will be a concurrent hyperkalaemia (because EDTA is in the form of K_3EDTA). Ionised calcium will also be artificially low.

The methodology for serum electrolyte analysis is susceptible to error and repeat sampling should be considered.

Since about 50% of the total serum calcium is bound to albumin, hypoalbuminaemia can result in low total serum calcium. There is a formula to correct for this, however, it is not accurate and animals may be hypocalcaemic despite a "normal" corrected calcium concentration. If clinical signs are suspicious for hypocalcaemia assess an ionised calcium because this is not affected by hypoalbuminaemia.

Lower concentrations of total serum calcium have been observed in dogs during the winter months, although the reason for this remains undetermined.

Diseases associated with hypocalcaemia

There are numerous causes for true hypocalcaemia. Not every case for every condition listed below will develop hypocalcaemia.

| Condition | Diagnosis |
|--|--|
| Blood transfusions: multiple | History of multiple transfusion – citrate toxicity |
| Low dietary calcium (eg poorly balanced home-made diets) | History Low or normal iCa High PTH* |
| Eclampsia | History Note: tCa may be normal Low iCa ± concurrent hypomagnesaemia, hyper/hypophosphataemia, hyperkalaemia |
| Ethylene glycol | iCa often normal Concurrent hyperglycaemia – 50% of cases Azotaemia due to renal insufficiency / failure High serum phosphate Low urine SG with presence of Ca-oxalate (monohydrate) |

| | |
|--------------------------------|---|
| | crystals |
| Hypomagnesaemia | Low serum Mg (impairs effect of PTH on target organs) |
| Hypoparathyroidism | tCa may be < 1.63 mmol/L High serum phosphate History eg neck surgery or injury Low iCa Low PTH |
| Malabsorption/malnutrition | Low albumin + globulin Requires intestinal biopsy for confirmation |
| Massive muscle trauma | Elevated CK and AST |
| Pancreatitis | Elevated lipase ± inflammatory leukogram, evidence of cholestasis etc |
| Phosphate enema | History High serum phosphate |
| Renal failure or insufficiency | Azotaemia |
| Sepsis | Inflammatory leukogram Low iCa NB HypoCa in sepsis is a negative prognostic indicator |
| Tumour lysis syndrome | HypoCa secondary to elevated phosphate |
| Vitamin D deficiency | Rare Low iCa Low phosphate Normal or increased PTH |

iCa – ionised calcium. tCa – total calcium

*PTH analysis is not available in NZ

Clinical signs

Clinical signs typically don't develop until total serum calcium is < 1.5 mmol/L or ionised calcium is < 0.8 mmol/L. Animals with total serum calcium < 1.13 mmol/L may develop life threatening neuromuscular abnormalities.

