

A Quick Reference on Hypercalcemia

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KEYWORDS

- Hypercalcemia • Hypervitaminosis D • Hyperparathyroidism
- Malignancy-associated hypercalcemia • Complexed calcium
- Protein-bound calcium • Ionized calcium • Total calcium

KEY POINTS

- In dogs, neoplasia is the most common cause of hypercalcemia, followed by primary hyperparathyroidism, chronic kidney disease, and hypoadrenocorticism.
- In cats, idiopathic hypercalcemia is the most common cause, followed by chronic kidney disease and then neoplasia.
- Prognosis and treatment ultimately depend on the cause of the hypercalcemia.

INTRODUCTION

- Total calcium (tCa) is composed of ionized calcium (iCa), protein-bound calcium, and complexed calcium.
- iCa is the biologically active fraction.
- Major hormones involved in calcium metabolism are parathyroid hormone (PTH); calcitriol (1,25-dihydroxyvitamin D); 24,25-dihydroxyvitamin D; and calcitonin.
- Major organs involved in calcium metabolism are bone, kidney, and small intestine.

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ANALYSIS

Indications

Serum tCa is measured routinely in biochemical panels. Previously, serum iCa was recommended if tCa were elevated. Currently, the authors recommend also measuring iCa independently because of the lack of concordance between the two. It has been shown that approximately 64% of cats with ionized hypercalcemia had normal tCa. The simultaneous measurement of PTH along with iCa is often helpful diagnostically if a diagnosis is not immediately apparent after history and physical examination.

Typical reference range (serum):

	Canine	Feline
tCa	9.0–11.5 mg/dL (2.2–3.8 mmol/L)	8.0–10.5 mg/dL (2.0–2.6 mmol/L)
iCa	5.0–6.0 mg/dL (1.2–1.5 mmol/L)	4.5–5.5 mg/dL (1.1–1.4 mmol/L)

- Do not use adjustment formulas to correct the tCa to serum total protein or albumin concentration. These formulas do not accurately predict iCa concentration.
- Do not directly compare serum iCa results to heparinized plasma or whole-blood iCa results (obtained via blood gas analyzer or point-of-care analyzer). The iCa concentration in heparinized plasma or whole blood is typically lower than the serum iCa concentration.
- Do not use EDTA plasma for iCa measurement. EDTA chelates calcium, resulting in very low iCa concentration.
- To convert calcium concentration from millimoles/liter to milligrams/deciliter, multiply millimoles/liter by 4.

Danger Values

- Interaction with phosphorus is important. If tCa (milligrams/deciliter) times phosphorus concentration is greater than 70, tissue mineralization is likely.
- If serum tCa is greater than 14 mg/dL, or iCa is greater than 1.6 mmol/L, clinical signs are usually present.
- If serum tCa is greater than 18 mg/dL, or iCa is greater than 2.2 mmol/L, the patient is usually critically ill.

Artifacts

- Serum iCa may be falsely elevated when stored in serum separator tubes.
- Severe lipemia of the serum may cause a false elevation in serum tCa concentration.

CAUSES OF HYPERCALCEMIA

- In dogs, neoplasia is the most common cause of hypercalcemia, followed by primary hyperparathyroidism, chronic kidney disease, and hypoadrenocorticism (**Box 1**).
- In cats, idiopathic hypercalcemia is the most common cause, followed by chronic kidney disease and then neoplasia (see **Box 1**).

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