



# Hypercalcemia

## (High Levels of Calcium in the Blood)

### Basics

#### OVERVIEW

- Excessive or high levels of calcium in the blood (known as “hypercalcemia”)
- Serum total calcium greater than 11.5 mg/dL on bloodwork in dogs
- Serum total calcium greater than 10.5 mg/dL on bloodwork in cats
- High levels of calcium in the blood (hypercalcemia) must be confirmed by the presence of increased concentrations of ionized calcium; serum ionized calcium greater than 1.45 mmol/L on bloodwork in dogs and greater than 1.4 mmol/L in cats is indicative of hypercalcemia

#### SIGNALMENT/DESCRIPTION OF PET

##### Species

- Dogs
- Cats

##### Breed Predispositions

- Primary hyperparathyroidism in the keeshond (dog) and Siamese (cat); “hyperparathyroidism” is an abnormal condition in which high levels of parathyroid hormone are circulating in the blood; parathyroid hormone regulates calcium levels in the body—it increases calcium levels by causing calcium to be reabsorbed from bone; “primary hyperparathyroidism” refers to a condition in which a tumor in the parathyroid gland produces excessive levels of parathyroid hormone, leading to increased blood calcium levels

#### SIGNS/OBSERVED CHANGES IN THE PET

- Depend on the cause of the high levels of calcium in the blood (hypercalcemia); many animals have no clinical signs
- Pets with underlying cancer, kidney failure, or low levels of steroids produced by the adrenal glands (known as “hypoadrenocorticism”) generally appear ill
- Pets with primary hyperparathyroidism (a condition in which a tumor in the parathyroid gland produces excessive levels of parathyroid hormone, leading to increased blood calcium levels) show mild clinical signs, if any, due solely to the effects of the high levels of calcium in the blood (hypercalcemia)
- Signs become apparent when high levels of calcium in the blood (hypercalcemia) are serious and long-term (chronic)
- Excessive urination (known as “polyuria” or PU) and excessive thirst (known as “polydipsia” or PD)—most

common in dogs

- Lack of appetite (known as “anorexia”)
- Sluggishness (lethargy)—most common in cats
- Vomiting
- Constipation
- Weakness
- Impaired consciousness in which animal must be stimulated to be awakened (known as “stupor”) and unconsciousness in which animal cannot be stimulated to be awakened (known as “coma”)—severe cases
- Lower urinary tract signs in animals with secondary calcium-containing stones (known as “uroliths”); the lower urinary tract includes the bladder and urethra (the tube from the bladder to the outside, through which urine flows out of the body); lower urinary tract signs include straining to urinate and painful urination
- Enlarged lymph nodes (known as “lymphadenomegaly”) or enlargement of abdominal organs (known as “abdominal organomegaly”) may be seen in pets with lymphoma (a type of cancer)
- Parathyroid gland benign tumors (known as “parathyroid gland adenomas”)—rarely can be felt in dogs during physical examination by the veterinarian; often can be felt in cats with primary hyperparathyroidism (a condition in which a tumor in the parathyroid gland produces excessive levels of parathyroid hormone, leading to increased blood calcium levels), but can be confused with the thyroid gland (the parathyroid glands are very small glands that are located immediately adjacent to the thyroid gland in the animal's neck)

## CAUSES

- Cancer—lymphoma (most common in dogs, less common in cats); anal-sac apocrine-gland adenocarcinoma (dogs); multiple myeloma; lymphocytic leukemia; metastatic bone cancer; fibrosarcoma (cats); various types of carcinoma
- Primary hyperparathyroidism (a condition in which a tumor in the parathyroid gland produces excessive levels of parathyroid hormone, leading to increased blood calcium levels)
- Kidney failure—sudden (acute) or long-term (chronic)
- Inadequate production of steroids by the adrenal glands (known as “hypoadrenocorticism” or “Addison's disease”)
- Vitamin D—rodenticide poisoning—vitamin D—rodenticides are designed to kill rodents (such as mice and rats); no longer marketed in the United States
- Vitamin D poisoning from plant or food sources
- Diseases that soften or destroy bone (known as “osteolytic diseases”)
- Aluminum toxicity
- High blood-calcium levels for unknown reasons (known as “idiopathic hypercalcemia”) in cats

## RISK FACTORS

- Keeshond (dog) and Siamese (cat)—primary hyperparathyroidism (a condition in which a tumor in the parathyroid gland produces excessive levels of parathyroid hormone, leading to increased blood calcium levels)
- Kidney failure
- Cancer
- Use of calcium supplements or calcium-containing intestinal phosphate binders
- Use of calcitriol or other vitamin D preparations

## Treatment

### HEALTH CARE

- Inpatient care, because of the deleterious effects of high levels of calcium in the blood (hypercalcemia) and the need for fluid therapy
- Very high levels of calcium in the blood (hypercalcemia) are a **MEDICAL EMERGENCY**

### ACTIVITY

- Depends on signs and underlying cause of high levels of calcium in the blood (hypercalcemia)

### DIET

- Depends on underlying cause of high levels of calcium in the blood (hypercalcemia)

## **SURGERY**

- Surgery may be indicated, based on cause of high levels of calcium in the blood (hypercalcemia), such as for cases with cancer as the underlying cause

## **Medications**

Medications presented in this section are intended to provide general information about possible treatment. The treatment for a particular condition may evolve as medical advances are made; therefore, the medications should not be considered as all inclusive

- Normal saline—fluid of choice
- Avoid calcium-containing fluids
- Drugs to eliminate fluids from the body (known as “diuretics,” such as furosemide) and steroids can be useful in treatment
- Sodium bicarbonate may be useful, in combination with other treatments
- Mithramycin has been used in cases with very serious signs related to high levels of calcium in the blood (known as “hypercalcemic crises”); avoid its use if possible, because of associated toxic effects to the kidney (known as “nephrotoxicity”) and liver (known as “hepatotoxicity”)
- Calcitonin may be useful in the treatment of cases with high levels of vitamin D (known as “hypervitaminosis D”)
- Pamidronate has been used successfully for treatment of high levels of calcium in the blood (hypercalcemia) of various causes in dogs and cats

## **Follow-Up Care**

### **PATIENT MONITORING**

- Check bloodwork for serum calcium levels every 12 hours; if possible, monitor serum ionized calcium levels
- Kidney function tests and urinalysis—the first sign of damage to the kidney tubules may be casts (accumulations of cellular debris and other material in the shape of a kidney tubule) in the urine sediment of the urinalysis
- Monitor urine output, particularly if kidney failure characterized by inadequate urine production (known as “oliguric renal failure”) is suspected, in which case urine output should be measured carefully
- Hydration status must be monitored; indicators of “overhydration” (that is, too much fluid in the body) include increased body weight and fluid buildup in the lungs (known as “pulmonary edema”) or under the skin (known as “subcutaneous edema”)

### **POSSIBLE COMPLICATIONS**

- High levels of calcium are toxic to the kidney tubules and can cause excessive urination (polyuria) and excessive thirst (polydipsia) and irreversible kidney failure; can lead to formation of stones in the urinary tract (urolithiasis) and associated lower urinary tract disease
- Soft-tissue mineralization, in which calcium is deposited into the tissues
- Changes in gastrointestinal function
- Skeletal muscle contractions may be depressed, thus causing weakness
- High blood pressure (hypertension) and changes in heart-muscle contractions

### **EXPECTED COURSE AND PROGNOSIS**

- Depends on cause of high levels of calcium in the blood (hypercalcemia) and extent of disease

## **Key Points**

- Excessive or high levels of calcium in the blood (known as “hypercalcemia”)
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- Signs become apparent when high levels of calcium in the blood (hypercalcemia) are serious and long term (chronic); excessive urination (known as “polyuria” or PU) and excessive thirst (known as “polydipsia” or PD)—most common in dogs; sluggishness (lethargy)—most common in cats

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# Notes

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