



ISSUES & ANSWERS

FROM THE DESK OF
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Parenteral Calcium for Hypocalcemia: Different Salts, Different Dosages

Differing concentrations of calcium can lead to inaccurate dosing and increased risk for adverse effects and/or therapeutic failure.



ISSUE

BECAUSE LIFE-THREATENING HYPOCALCEMIA IS UNCOMMON IN SMALL ANIMALS, the need for parenteral calcium for acute management is infrequent. It may, however, be required in certain clinical situations, including in patients with eclampsia (ie, periparturient hypocalcemia) or hypoparathyroidism (primary or secondary). Injectable calcium gluconate has been the preferred salt for parenteral use in small animals but may not always be available, making use of other parenteral calcium salt products (eg, calcium chloride, calcium borogluconate) necessary. However, differing calcium concentrations of these alternative calcium salts as compared with calcium gluconate can lead to inaccurate dosing and increased risk for adverse effects and/or therapeutic failure.

DOSING PARENTERAL CALCIUM CAN BE CONFUSING AND DANGEROUS.

Dosages vary among references and are listed by mL/kg, mEq/kg, mmol/kg, or mg/kg. These may be for the calcium salt used or for elemental calcium. For example, calcium chloride 10% (100 mg/mL) injection contains ≈ 3 times more elemental calcium per mL as compared with calcium gluconate 10% (100 mg/mL). All dosages should be double-checked by another veterinary professional.



ANSWERS

The anecdotal dosage for severe hypocalcemia (eg, tetany, seizures) in dogs and cats ranges from 5 to 15 mg/kg of elemental calcium IV slowly over 10 to 30 minutes.

- When using calcium gluconate 10% injection, each mL contains 9.3 mg of elemental calcium, so 5 to 15 mg/kg elemental calcium would equate to 0.54 to 1.61 mL/kg of calcium gluconate 10% injection.
- When using calcium chloride 10% injection, each mL contains 27.2 mg of elemental calcium, so doses of 5 to 15 mg/kg elemental calcium would equate to 0.18 to 0.56 mL/kg of calcium chloride 10% injection.
- When using other concentrations or other salts (eg, calcium borogluconate), the actual volume to inject will vary, depending on the concentration of the solution and which salt is being used (eg, calcium borogluconate 23% contains 19.14 mg of elemental calcium per mL).



Oral Suspension for Cats

**Veraflox (pradofloxacin) Oral Suspension for Cats
25 mg/mL**

For the treatment of skin infections (wounds and abscesses) in cats.
Do not use in dogs.

BRIEF SUMMARY:

Before using Veraflox Oral Suspension for Cats, please consult the product insert, a summary of which follows:

CAUTION:

Federal law restricts this drug to use by or on the order of a licensed veterinarian. Federal law prohibits the extra-label use of this drug in food-producing animals.

PRODUCT DESCRIPTION:

Pradofloxacin is a fluoroquinolone antibiotic and belongs to the class of quinolone carboxylic acid derivatives. Each mL of Veraflox Oral Suspension provides 25 mg of pradofloxacin.

INDICATIONS:

Veraflox is indicated for the treatment of skin infections (wound and abscesses) in cats caused by susceptible strains of *Pasteurella multocida*, *Streptococcus canis*, *Staphylococcus aureus*, *Staphylococcus felis*, and *Staphylococcus pseudintermedius*.

CONTRAINDICATIONS:

DO NOT USE IN DOGS. Pradofloxacin has been shown to cause bone marrow suppression in dogs. Dogs may be particularly sensitive to this effect, potentially resulting in severe thrombocytopenia and neutropenia. Quinolone-class drugs have been shown to cause arthropathy in immature animals of most species tested, the dog being particularly sensitive to this side effect. Pradofloxacin is contraindicated in cats with a known hypersensitivity to quinolones.

HUMAN WARNINGS:

Not for human use. Keep out of reach of children. Individuals with a history of quinolone hypersensitivity should avoid this product. Avoid contact with eyes and skin. In case of ocular contact, immediately flush eyes with copious amounts of water. In case of dermal contact, wash skin with soap and water for at least 20 seconds. Consult a physician if irritation persists following ocular or dermal exposure or in case of accidental ingestion. In humans, there is a risk of photosensitization within a few hours after exposure to quinolones. If excessive accidental exposure occurs, avoid direct sunlight. Do not eat, drink or smoke while handling this product. For customer service or to obtain product information, including a Material Safety Data Sheet, call 1-800-633-3796. For medical emergencies or to report adverse reactions, call 1-800-422-9874.

ANIMAL WARNINGS:

For use in cats only. The administration of pradofloxacin for longer than 7 days induced reversible leukocyte, neutrophil, and lymphocyte decreases in healthy, 12-week-old kittens.

PRECAUTIONS:

The use of fluoroquinolones in cats has been associated with the development of retinopathy and/or blindness. Such products should be used with caution in cats. Quinolones have been shown to produce erosions of cartilage of weight-bearing joints and other signs of arthropathy in immature animals of various species. The safety of pradofloxacin in cats younger than 12 weeks of age has not been evaluated. The safety of pradofloxacin in immune-compromised cats (i.e., cats infected with feline leukemia virus and/or feline immune-deficiency virus) has not been evaluated. Quinolones should be used with caution in animals with known or suspected central nervous system (CNS) disorders. In such animals, quinolones have, in rare instances, been associated with CNS stimulation that may lead to convulsive seizures. The safety of pradofloxacin in cats that are used for breeding or that are pregnant and/or lactating has not been evaluated.

ADVERSE REACTIONS:

In a multi-site field study, the most common adverse reactions seen in cats treated with Veraflox were diarrhea/loose stools, leukocytosis with neutrophilia, elevated CPK levels, and sneezing.

ANIMAL SAFETY:

In a target animal safety study in 32, 12-week-old kittens dosed at 0, 1, 3, and 5 times the recommended dose for 21 consecutive days. One 3X cat and three 5X cats had absolute neutrophil counts below the reference range. The most frequent abnormal clinical finding was soft feces. While this was seen in both treatment and control groups, it was observed more frequently in the 3X and 5X kittens.

U.S. Patent No. 6,323,213

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Bayer

Bayer HealthCare LLC

Animal Health Division

Shawnee Mission, Kansas 66201, U.S.A.

Patient response determines the final calcium dose.

During infusion, continually monitor the patient's heart rate and rhythm (via electrocardiogram) and respiratory rate.

- If bradycardia, ST segment elevation, or QT interval shortening occurs, temporarily stop the infusion; restart at a lower rate if the patient requires additional parenteral calcium treatment.

CAUTIONS

Calcium gluconate (not calcium chloride) diluted 1:1 has generally been regarded as safe to administer SC for the treatment of primary hypoparathyroidism in dogs, but there are now case reports of severe tissue reactions (eg, pyogranulomatous panniculitis, adipocyte mineralization) at the injection site.^{1,2}

Cats, smaller dogs, and patients with concurrent hypophosphatemia may be more susceptible.

- Use caution when considering SC administration, particularly in smaller dogs or when used concurrently with calcitriol.
- A recent review article on hypocalcemia in critically ill dogs and cats stated that SC administration of calcium salts is not recommended.³

Other adverse effects associated with parenteral calcium include hypercalcemia and venous (IV) irritation.

- Calcium chloride may be more irritating and more likely to cause hypotension than other parenteral salts.
- Too-rapid IV calcium injection can cause hypotension, cardiac arrhythmias, and cardiac arrest.

If calcium salts are inadvertently infused perivascularly, stop the infusion.

- Treatment may include infiltrating the affected area with normal saline, locally administering corticosteroids, applying heat to and elevating the area, and infiltrating the affected area with a local anesthetic and hyaluronidase.⁴

Avoid admixing parenteral calcium salts with other drugs, particularly carbonate, phosphate, sulfate, or tartrate salts.

- Chelation occurs when calcium salts are mixed with tetracyclines.
- Death has been reported in human neonates when calcium salts are administered with ceftriaxone.⁵

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