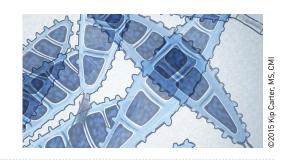


# Microsporum canis

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Terbinafine is well tolerated and may be used as an alternative when a toxic reaction develops after

administration of

other antifungal

drugs.8-12

### Itraconazole

**Dogs:** 5 mg/kg PO once a day for 7 days, stop for 7 days; repeat pattern 3 times<sup>1,2</sup>

Cats: 5 mg/kg PO once a day for 7 days, stop for 7 days; repeat pattern 3 times<sup>1,2</sup>

Itraconazole, a fungistatic triazole, inhibits the cytochrome P450 enzyme lanosterol  $14\alpha$ -demethylase, which converts lanosterol to ergosterol. Decreases in ergosterol affect membrane permeability. Avoid alkalinizing agents (eg, H<sub>2</sub>-blockers, antacids). Alanine aminotransferase (ALT) and serum alkaline phosphatase (SAP) levels may rise without liver disease signs, though hepatotoxicity is rare.

In cats, the oral solution is preferred to capsules.<sup>4</sup> Generic and compounded itraconazole have not been shown to be bioequivalent to Sporanox (janssenpharmaceuticalsinc.com).<sup>5</sup> Generic formulations have shown similar pharmacokinetic data; compounded itraconazole has produced low plasma concentrations in dogs and should be avoided.<sup>5</sup>

## **Terbinafine**

**Dogs (Oral):** 30-35 mg/kg PO once a day<sup>6,7</sup> **Cats (Oral):** 20 mg/kg PO once a day<sup>6,8</sup> **Dogs, Cats (Topical):** Apply to affected areas once or twice a day<sup>9</sup>

Formulation: Topical, oral

Terbinafine, an allylamine antifungal agent, is effective and concentrates well in the skin, is well tolerated, and may be used as an alternative when a toxic reaction develops after administration of other antifungal drugs. 8-12 To date, there have been no efficacy comparison studies between itraconazole and terbinafine.

## Fluconazole

**Dogs:** 5-10 mg/kg PO twice a day<sup>13-15</sup>

Cats: 50 mg/cat PO once a day<sup>14,15</sup>

Fluconazole is a fungistatic bistriazole that inhibits cytochrome P450-mediated sterol synthesis. Food and gastric pH do not alter bioavailability; it is well tolerated orally. 14,15

# **Topical Recommendations**

(twice a week)16

- Lime sulfur (1:16)
- Enilconazole (1:100)
- Accelerated hydrogen peroxide rinse (1:20)
- Climbazole mousse
- Ketoconazole (1%-2%) shampoo
- Miconazole (1%-2%) shampoo

Compounded itraconazole has produced low plasma concentrations in dogs and should be avoided.<sup>5</sup>

 $H_2$  = histamine receptor  $H_2$ 

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### REFERENCES

- Miller WH Jr, Griffin CE, Campbell KL. Fungal and algal skin diseases. In: Miller WH Jr, Griffin CE, Campbell KL, eds. Muller and Kirk's Small Animal Dermatology. 7th ed. St. Louis, MO: Elsevier Mosby; 2013:223-283.
- Moriello KA. Treatment of dermatophytosis in dogs and cats: review of published studies. Vet Dermatol. 2004;15(2):99-107.
- 3. de Jaham C, Paradis M, Papich MG. Antifungal dermatologic agents: azoles and allylamines. *Compend Contin Educ Pract Vet*. 2000;22(6):548-559.
- 4. Boothe DM, Herring I, Calvin J, Way N, Dvorak J. Itraconazole disposition after single oral and intravenous and multiple oral dosing in healthy cats. *Am J Vet Res.* 1997;58(8):872–877.
- Mawby DI, Whittemore JC, Genger S, Papich MG. Bioequivalence of orally administered generic, compounded, and innovatorformulated itraconazole in healthy dogs. JVIM. 2014;28(1):72-77.
- Sakai MR, May ER, Imerman PM, et al. Terbinafine pharmacokinetics after single dose oral administration in the dog. Vet Dermatol. 2011;22(6):528-534.
- 7. Wang A, Ding H, Liu Y, Gao Y, Zeng Z. Single dose pharmacokinetics of terbinafine in cats. *J Feline Med Surg*. 2012;14(8): 540-544.
- 8. Castañón-Olivares LR, Manzano-Gayosso P, López-Martínez R, De la Rosa-Velázquez IA, Soto-Reyes-Solís E. Effectiveness of terbinafine in the eradication of *Microsporum canis* from laboratory cats. *Mycoses*. 2001;44(3-4):95-97.
- Plumb DC. Brief Media. Plumb's Veterinary Drugs. plumbsveterinarydrugs.com. Accessed June 25, 2015.
- Sykes J. Treatment of fungal infections: the which, why and how of antifungal drug therapy. ACVIM Forum Proceedings. New Orleans, LA. 2012.
- Balda AC, Otsuka M, Larsson CE. A clinical trial using griseofulvin and terbinafine in the treatment of canine and feline dermatophytosis. Ciência Rural. 2007;37(3)750-754.
- 12. Hosseini-Yeganeh M, McLachlan AJ. Physiologically based pharmacokinetic model for terbinafine in rats and humans. *Antimicrob Agents Chemother*. 2002;46(7)2219-2228.

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### Rapinovet<sup>™</sup> (propofol) Anesthetic Injection

Emulsion for intravenous use in dogs and cats.

BRIEF SUMMARY: Before using Rapinovet™ (propofol), 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.

WARNINGS: Induction of anesthesia with Rapinovet™ injection is frequently associated with apnea and respiratory depression. Hypotension and oxygen desaturation can occur also, especially following rapid bolus administration. Apnea is observed less frequently following maintenance doses of Rapinovet™ injection when given as the sole maintenance agent, or when a maintenance dose is administered during inhalant anesthesia.

When using Rapinovet™ injection, patients should be continuously monitored, and facilities for the maintenance of a patent airway, artificial ventilation, and oxygen supplementation must be immediately available. The clinical use of propofol without available supplemental oxygen and artificial ventilation has not been adequately evaluated and is not recommended.

SIDE EFFECTS: The primary side effect of Rapinowet\* injection in dogs is respiratory depression and apnea. Apnea was observed in 20% of the dog cases in the clinical trial. Apnea was observed in 1.4% of the cat cases in the clinical trial. All apnea cases responded satisfactorily to oxygen supplementation and/or controlled ventilation.

The primary side effect of Rapinovet™ injection in cats is paddling during recovery. Paddling was observed in 11% of the cat cases in the clinical trial.

Other transient side effects in dogs or cats are observed infrequently or rarely:

Respiratory: panting, reverse sneezing, cyanosis - Musculoskeletal: paddling during recovery, tremors, tenseness, movements, fasciculations - Cardiovascular: bradycardia, hypotension, cyanosis, tachycardia, premature ventricular contractions - Central Nervous System: excitation, opisthotonus, seizure - Injection Site: pain during injection - Gastrointestinal: emesis/retching - Other: rubbing at face or nose during recovery, vocalization during recovery, chewing or licking the injection site during recovery.

#### PRECAUTIONS:

- Rapinovet™ injection contains no antimicrobial preservatives. Strict aseptic techniques must always be maintained during handling since the vehicle is capable of supporting rapid growth of microorganisms. Failure to follow aseptic handling procedures may result in microbial contamination causing fever, infection/sepsis, and/or life-threatening illness. Do not use if contamination is suspected.
- When using Rapinovet<sup>111</sup> injection, patients should be continuously monitored, and facilities for the maintenance
  of a patent airway, artificial ventilation, and oxygen supplementation must be immediately available. The clinical use
  of propofol without available supplemental oxygen and artificial ventilation has not been adequately evaluated and is
  not recommended.
- 3. Anesthesia effects: Careful monitoring of the patient is necessary when using Rapinovet<sup>™</sup> injection as a maintenance anesthetic due to the possibility of rapid arousal. Apnea may occur following maintenance doses of Rapinovet<sup>™</sup> injection.
- Physiological effects: During induction of anesthesia, mild hypotension and increased heart rate may occur when Rapinovet™ injection is used alone.
- Premedicants: Premedicants may increase the anesthetic or sedative effect of Rapinovet™ injection and result in
  more pronounced changes in systolic, diastolic, and mean arterial blood pressures. The use of ketamine (an approved
  compound for restraint in cats) is not recommended as a preanesthetic prior to propofol due to an increased number of
  patients experiencing apnea.
- 6. Breeding Animals: Adequate data concerning the safe use of Rapinovet™ injection in pregnant, lactating, and breeding dogs and cats have not been obtained. Propofol crosses the placenta, and as with other general anesthetic agents, the administration of propofol may be associated with neonatal depression.
- 7. Puppies and Kittens: The use of propofol has not been evaluated in puppies or kittens.
- 8. Compromised or debilitated dogs and cats: Doses may need adjustment for geriatric or debilitated patients. The administration of Rapinovet\* injection to patients with renal failure and/or hepatic failure has not been evaluated. As with other anesthetic agents, caution should be exercised in dogs or cats with cardiac, respiratory, renal or hepatic impairment, or in hypovolemic or debilitated dogs and cats.
- 9. Sighthounds: Rapinovet™ injection induction followed by inhalant anesthetic agents produced satisfactory anesthesia and recovery times in sighthounds. Propofol alone in 6 greyhounds and 7 non-greyhounds showed satisfactory, but longer recovery times in the greyhounds (averages of 47 and 18 minutes, respectively).¹ In a propofol pharmacokinetics study, greyhounds had higher propofol levels in plasma, a lower volume of distribution, slower total body clearance rates, and longer recovery times than did mixed-breed dogs. The elimination half-life was similar in both groups.³
- 10. Arrhythmogenicity: In one study in dogs, propofol increased myocardial sensitivity to the development of epinephrine-induced ventricular arrhythmias in a manner similar to other anesthetics.<sup>4</sup>
- 11. Consecutive day treatment: Heinz bodies increased dramatically in cats following repeat administration of propofol on consecutive days and were associated with decreases in RBC count and hematocrit. Large numbers of Heinz bodies can lead to hemolytic anemia. <sup>56</sup> In one study in cats, treatment with propofol once a day for 3 days led to a marked increase in Heinz bodies. Treatment for 5 or more consecutive days resulted in generalized malaise and/or facial edema; clinical signs of illness resolved within 24 to 48 hours after cessation of propofol.
- 12. Concurrent Medication: No significant adverse interactions with commonly used drugs have been observed.
- 13. Perivascular Administration: Perivascular administration does not produce local tissue reaction.

**CONTRAINDICTIONS:** Rapinovet<sup>w</sup> injection is contraindicated in dogs and cats with a known hypersensitivity to propofol or its components, or when general anesthesia or sedation are contraindicated.

HUMAN USER SAFETY: Not for human use. Keep out of reach of children.

Rapinovet™ injection should be managed to prevent the risk of diversion, through such measures as restriction of access and the use of drug accountability procedures appropriate to the clinical setting. Rare cases of self-administration of propofol have been reported, including dose-related fatalities.

The material safety data sheet (MSDS) contains more detailed occupational safety information. For customer service, and/or a copy of the MSDS, call 1-800-633-3796. To report adverse effects, call 1-800-422-9874.

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