Laboratory Considerations
No specific laboratory interactions or considerations noted

Doses
- **DOGS:**

For pain and inflammation associated with osteoarthritis:

a) On first day of treatment give 20 mg/kg PO (or 10 mg/kg PO); subsequently give 10 mg/kg PO once daily. Duration of treatment should be based on clinical response and patient tolerance to therapy. (Package insert; *Zubrin*®—Schering-Plough)

Monitoring
- Clinical efficacy
- Baseline and periodic CBC, chemistry panel (including bilirubin and serum creatinine)
- Signs associated with adverse effects (GI effects, appetite, vomiting, diarrhea, etc.)

Client Information
- When dosing, the person administering the tablet should place it in dog's mouth and hold mouth closed for approximately 4 seconds to assure tablet disintegration
- Absorption may be enhanced (and vomiting reduced?) if given with food
- Owners should be instructed to discontinue the drug and contact their veterinarian if diarrhea is severe or persists, or signs such as inappetence, vomiting, fecal abnormalities, anemia, icterus or lethargy are observed
- Dogs should have access to water; dehydration should be avoided
- The manufacturer provides a client information sheet and states to "Always provide client information sheet . . ."

Chemistry/Synonyms
A non-steroidal antiinflammatory agent (NSAID), tepoxalin occurs as a white, tasteless, crystalline material that is insoluble in water and soluble in alcohol and most organic solvents. The commercially available tablets contain a micronized form of the drug in a highly porous matrix that rapidly disintegrates in the mouth. Drug particles are released into the saliva and swallowed by the dog where it is absorbed in the intestines.

Tepoxalin may also be known as ORF-20485, RWJ-20485 and *Zubrin*®.

Storage/Stability
Tablets should be kept in their foil blister packs until used and stored at temperatures between 2–30°C (36–86°F).

Dosage Forms/Regulatory Status
VETERINARY-LABELED PRODUCTS:

Tepoxalin Oral (rapidly-disintegrating) Tablets: 30 mg, 50 mg, 100 mg, 200 mg in foil blisters containing 10 tablets in boxes of 10 foil blisters; *Zubrin*® (Schering-Plough); (Rx). Approved for use in dogs.

HUMAN-LABELED PRODUCTS: None

TERBINAFINE HCL (SYSTEMIC)

(ter-***bin***-ah-fin) Lamisil®

ANTIFUNGAL

Prescriber Highlights
- Oral & topical antifungal; used primarily for dermatophytic infections, but may be useful for other fungi (*e.g.*, aspergillus), especially in birds
- Comparatively (with azole antifungals) few drug interactions
- Appears to be very well tolerated, but limited experience; vomiting most likely adverse effect
- Caution if liver or renal disease
- Treatment is relatively expensive, but generics are now available

Uses/Indications
Terbinafine may be useful for treating dermatophytic and other fungal infections in dogs and cats.

Terbinafine may also be useful for treating birds for systemic mycotic (*e.g.*, aspergillosis) infections.

Pharmacology/Actions
Terbinafine is an inhibitor of the synthesis of ergosterol, a component of fungal cell membranes. By blocking the enzyme squalene monooxygenase (squalene 2,3-epoxidase), terbinafine inhibits the conversion of squalene to sterols (especially ergosterol) and causes accumulation of squalene. Both these effects are thought to contribute to its antifungal action. Terbinafine's mechanism for inhibiting ergosterol is different from the azole antifungals.

Unlike the azole agents, terbinafine's actions are not mediated via the cytochrome P-450 enzyme system, and, therefore, do not have the concerns of drug interactions or altering testosterone or cortisol.

Terbinafine primarily has clinical activity (fungicidal) against dermatophytic organisms (*Microsporum* spp., *Trichophyton* spp., etc.). It may only be fungistatic against the yeasts (*Candida* spp.). Terbinafine has activity against Aspergillus, Blastomyces, and Histoplasma but is usually not used clinically for infections caused by these organisms.

Pharmacokinetics
Little veterinary specific information is available. In cats dosed at 34–46 mg/kg PO once daily for 14 days terbinafine persisted in hair above MIC for several weeks. (Foust, Marsella et al. 2007)

In humans, terbinafine given orally is greater than 70% absorbed; after first pass, metabolism bioavailability is about 40%. Food may enhance absorption somewhat. Terbinafine is distributed to skin and into the sebum. Over 99% of drug in plasma is bound to plasma proteins. Drug in the circulation is metabolized in the liver and the effective elimination half-life is about 36 hours. The drug may persist in adipose tissue and skin for very long periods.

Contraindications/Precautions/Warnings
Terbinafine is contraindicated in patients hypersensitive to it. The manufacturer does not recommend its use in patients with active or chronic liver disease or with significantly impaired renal function. If terbinafine is to be used in veterinary patents with markedly impaired liver or renal function, do so with extreme caution; dosage adjustments should be considered.

Adverse Effects
Because of limited usage in veterinary patients the adverse effect profile is not well defined, but thus far, the drug appears to be well tolerated. GI effects (vomiting, inappetence, diarrhea) are possible.

Very rarely in humans, liver failure, neutropenia or serious skin reactions (*e.g.*, TEN, Stevens-Johnson syndrome) have occurred after terbinafine use.

Reproductive/Nursing Safety
High dose studies in pregnant rabbits and rats have not demonstrated overt fetotoxicity or teratogenicity, but definitive safety in pregnancy has not been determined. Use with caution (manufacturer recommends NOT using in pregnant women). In humans, the FDA categorizes this drug as category ***B*** for use during pregnancy (*Animal studies have not yet demonstrated risk to the fetus, but there are no adequate studies in pregnant women; or animal studies have shown an adverse effect, but adequate studies in pregnant women have not demonstrated a risk to the fetus in the first trimester of pregnancy, and there is no evidence of risk in later trimesters.*)

The drug enters maternal milk at levels 7 times that found in plasma; the manufacturer recommends that mothers not nurse while taking this drug. Use with caution in nursing veterinary patients.

Overdosage/Acute Toxicity
Limited information; humans have taken doses of up to 5 grams without serious effects.

Drug Interactions
The following drug interactions have either been reported or are theoretical in humans or animals receiving terbinafine and may be of significance in veterinary patients:

- **CYCLOSPORINE:** Terbinafine may increase the elimination of cyclosporine
- **RIFAMPIN:** May increase terbinafine clearance

As it shares the same metabolic pathway (CYP2D6), terbinafine could affect the metabolism of:

- **BETA-BLOCKERS**
- **MAO INHIBITORS** (**amitraz, selegiline**)
- **SSRI'S** (**fluoxetine,** etc.)
- **TRICYCLIC ANTIDEPRESSANTS**

Laboratory Considerations
No apparent issues

Doses
- **DOGS & CATS:**

For dermatophytic infections:

a) 30–40 mg/kg PO once daily (Moriello 2004)

b) 30 mg/kg PO once daily. Treatment should continue until two successive brush cultures (separated by two weeks) are negative. First culture can be taken 3–4 weeks after starting therapy. (Foil 2003b)

c) In cases where other drugs are not tolerated: 25 mg/kg PO q24h. (Rosenkrantz 2006a)

For adjunctive treatment (with topical therapy) of nasal Aspergillus infections if the cribriform pate is penetrated:

a) 5–10 mg/kg PO q12h for 3–6 months (Kuehn 2007)

For pythiosis where advanced disease precludes complete surgical excision:

a) 10 mg/kg PO q24h with itraconazole (10 mg/kg PO twice daily) (Marks 2007a)

For lagendiosis where disease precludes complete surgical excision:

a) 5–10 mg/kg PO q24h with itraconazole (10 mg/kg PO q24h) with repeated aggressive surgical resection was effective in one dog with multifocal cutaneous lesions, but no systemic lesions. (Grooters 2007)

- **BIRDS:**

For avian mycotic infections:

a) 10–15 mg/kg PO q12–24h (Dalhausen, Lindstrom et al. 2000)

b) 10–15 mg/kg PO q12–24h (suspend a 250 mg tablet in 25 mL water); Nebulization: 1 mg/mL (500 mg terbinafine plus 1 mL *Mucomyst*® plus 500 mL of distilled water). Terbinafine can be used in combination with itraconazole. (Flammer 2003a)

Monitoring
- Clinical efficacy
- Baseline liver enzymes and then as needed (especially if treating long-term)

Client Information
- Costs of treating can be considerable
- Give with food, particularly if vomiting is a problem

Chemistry/Synonyms
A synthetic allylamine antifungal, terbinafine HCl occurs as a white to off-white, fine, crystalline powder. It is slightly soluble in water and soluble in ethanol.

Terbinafine HCl may also be known as: *Alamil*®, *Daskil*®, *Daskyl*®, *DesenexMax*®, *Finex*®, *Lamisil*®, *Maditez*®, *Micosil*®, or *Terekol*®.

Storage/Stability
Terbinafine tablets should be stored at room temperature, in tight containers; protect from light.

Dosage Forms/Regulatory Status
VETERINARY-LABELED PRODUCTS: None

HUMAN-LABELED PRODUCTS:

Terbinafine HCl Tablets: 250 mg; *Lamisil*® (Novartis), generic; (Rx)

A topical cream and spray (1%) are also available (Rx).

TERBUTALINE SULFATE

(ter-*byoo*-ta-leen) Brethine®

BETA-ADRENERGIC AGONIST

Prescriber Highlights
- **Beta agonist used as a bronchodilator & sometimes to treat bradyarrhythmias**
- **Contraindications: Hypersensitivity to terbutaline**
- **Caution: Diabetes, hyperthyroidism, hypertension, seizure disorders, or cardiac disease (especially with concurrent arrhythmias)**
- **Adverse Effects: Increased heart rate, tremors, CNS excitement (nervousness) & dizziness; after parenteral injection in horses, sweating & CNS excitation are possible**