Drug Interactions; Laboratory Considerations
None have been noted for this combination, but it would be expected that the potential interactions outlined for the trimethoprim/sulfa monograph would also apply to this combination; refer to that monograph for more information.

Doses
- **DOGS:**

For susceptible infections:

a) Initially 55 mg/kg (combined drug) PO on the first day of therapy, then 27.5 mg/kg PO once daily for at least 2 days after remission of clinical signs. Not approved for treatment longer than 21 days. (Package insert; *Primor*®—Pfizer)

Monitoring
- Clinical efficacy
- Adverse effects

Client Information
- Animals must be allowed free access to water and must not become dehydrated while on therapy.

Chemistry/Synonyms
A diaminopyrimidine structurally related to trimethoprim, ormetoprim occurs as a white, almost tasteless powder. The chemistry of sulfadimethoxine is described in the previous monograph.

Sulfadimethoxine may also be known as: solfadimetossina, solfadimetossipirimidina, sulphadimethoxine, *Chemiosalfa®, Deltin®, Risulpir®, Ritarsulfa®, Sulfadren®, Sulfastop®,* or *Sulfathox®.*

Ormetoprim may also be known as NSC-95072, ormetoprima, ormétoprime, ormetoprimum, or Ro-5-9754.

Storage/Stability
Unless otherwise instructed by the manufacturer, store tablets in tight, light resistant containers at room temperature.

Dosage Forms/Regulatory Status
VETERINARY-LABELED PRODUCTS:

Sulfadimethoxine/Ormetoprim Tablets (scored)

120's: 100 mg Sulfadimethoxine, 20 mg Ormetoprim

240's: 200 mg Sulfadimethoxine, 40 mg Ormetoprim

600's: 500 mg Sulfadimethoxine, 100 mg Ormetoprim

1200's: 1000 mg Sulfadimethoxine, 200 mg Ormetoprim; *Primor®* (Pfizer); (Rx) Approved for use in dogs.

Sulfadimethoxine/Ormetoprim medicated premix: 113.5 g sulfadimethoxine and 68.1 g ormetoprim per pound in 50 lb bags. Approved for use in chickens [broilers, replacements (breeders and layers)], turkeys, ducks, & Chukar partridges. Slaughter withdrawal (at labeled doses) = 5 days. Do not feed to chickens over 16 weeks or age, turkeys or ducks producing eggs for food. *Rofenaid® 40* (Alpharma), *Romet® 30* (Alpharma)—Approved for use in salmonids (trout and salmon) and catfish. Slaughter or release as stocker fish = 42 days. (OTC)

HUMAN-LABELED PRODUCTS: None

SULFASALAZINE

(sul-fa-***sal***-a-zeen) Azulfidine®

SULFONAMIDE/SALICYLATE ANTIBACTERIAL/ IMMUNOSUPPRESSIVE

Prescriber Highlights
- Sulfa-analog that has GI antibacterial & antiinflammatory activity used for inflammatory bowel disease; has also been used for vasculitis
- Contraindications: Hypersensitivity to it, sulfas or salicylates; intestinal or urinary obstructions
- Caution: Liver, renal or hematologic diseases; cats
- Adverse Effects: DOGS: Keratoconjunctivitis sicca, anorexia, vomiting, cholestatic jaundice, hemolytic anemia, leukopenia, vomiting, decreased sperm counts & an allergic dermatitis. CATS: Anorexia, vomiting, anemias

Uses/Indications
Sulfasalazine is used for the treatment of inflammatory bowel disease in dogs and cats. It has also been suggested for adjunctive use in treating vasculitis in dogs.

Pharmacology/Actions
While the exact mechanism of action for its therapeutic effects in treating colitis in small animals has not been determined, it is believed that after sulfasalazine is cleaved into sulfapyridine and 5-aminosalicylic acid (5-ASA, mesalamine) by bacteria in the gut the antibacterial (sulfapyridine) and/or antiinflammatory (mesalamine) activity alters the clinical signs/course of the disease. Levels of both drugs in the colon are higher then by giving them orally as separate agents.

Pharmacokinetics
Only about 10–33% of an orally administered dose of sulfasalazine is absorbed. Apparently, some of this absorbed drug is then excreted unchanged in the bile. Unabsorbed and biliary excreted drug is cleaved into 5-ASA and sulfapyridine in the colon by bacterial flora. The sulfapyridine component is rapidly absorbed, but only a small percentage of the 5-ASA is absorbed.

Absorbed sulfapyridine and 5-ASA are hepatically metabolized and then renally excreted.

Contraindications/Precautions/Warnings
Sulfasalazine is contraindicated in animals hypersensitive to it, sulfonamides or salicylates. It is also contraindicated in patients with intestinal or urinary obstructions. It should be used with caution in animals with preexisting liver, renal or hematologic diseases. Because cats can be sensitive to salicylates (see the aspirin monograph), use caution when using this drug in this species.

Adverse Effects
Although adverse effects do occur in dogs, with keratoconjunctivitis sicca (KCS) reported most frequently, they are considered to occur relatively uncommonly. Other potential adverse effects include anorexia, vomiting, cholestatic jaundice, hemolytic anemia, leukopenia, vomiting, decreased sperm counts and an allergic dermatitis. Should decreased tear production be noted early, either reducing the dose or discontinuing the drug may prevent progression of KCS or increase tear production.

Cats can occasionally develop anorexia and vomiting which may be alleviated by use of the enteric-coated tablets. Anemias secondary to sulfasalazine are also potentially possible in cats.

Reproductive/Nursing Safety

Although sulfasalazine has not been proven harmful to use during pregnancy and incidences of neonatal kernicterus in infants born to women taking sulfasalazine are low, it should only be used when clearly indicated. In laboratory animal studies (rats, rabbits), doses of six times normal (human) caused impairment of fertility in male animals; this effect is thought to be caused by the sulfapyridine component and was reversible upon discontinuation of the drug.

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.*) In a separate system evaluating the safety of drugs in canine and feline pregnancy (Papich 1989), this drug is categorized as in class: ***B*** (*Safe for use if used cautiously. Studies in laboratory animals may have uncovered some risk, but these drugs appear to be safe in dogs and cats or these drugs are safe if they are not administered when the animal is near term.*)

Sulfonamides are excreted in milk. In human newborns, they compete with bilirubin for binding sites on plasma proteins and may cause kernicterus. Use with caution in nursing patients.

Overdosage/Acute Toxicity

Little specific information is available regarding overdoses with this agent, but because massive overdoses could cause significant salicylate and/or sulfonamide toxicity, standard protocols (empty stomach, cathartics, etc.) should be considered. Urine alkalinization and forced diuresis may also be beneficial in selected cases.

Drug Interactions

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

- **CHLORPROPAMIDE**: Hypoglycemic effects could be potentiated
- **DIGOXIN**: Sulfasalazine may reduce absorption
- **FERROUS SULFATE** or **other iron salts**: May decrease the blood levels of sulfasalazine if administered concurrently; clinical significance is unknown
- **FOLIC ACID**: Oral absorption may be inhibited
- **WARFARIN**: Potentially sulfasalazine could potentiate warfarin

Doses

- **DOGS:**

  For inflammatory large bowel disease:

  a) 20–30 mg/kg q8–12h PO. (Hall 2004)

  b) 10–15 mg/kg PO q8–12h for 2 weeks tapered to the lowest effective dose (Moore 2004)

  c) 20–48.4 mg/kg (maximum total dose of one gram in refractory patients) PO q8h. May consider an initial dose of 12.5 mg/kg, q8h. Continue initial dose for a minimum of 4 weeks before modifying dosage. After signs of disease resolve, reduce dosage by 25% at 2 week intervals and eventually discontinue while maintaining dietary management. (Jergens and Willard 2000)

  d) For chronic colitis: If hypoallergenic diet does not control signs, sulfasalazine 20–50 mg/kg (up to a maximum of 1 gram) three times daily. Initial dosage usually 20–30 mg/kg three times daily. Dose may be reduced at 2–4 week intervals if stool remains normal using the following protocol: Initially same dose given twice daily, then 50% of initial dose twice daily, then 50% of that dose once daily, then discontinue. Some dogs may require chronic therapy. (Leib 2000)

  e) Usual initial dose is 20–40 mg/kg q8h for 3 weeks, followed by 20–40 mg/kg PO q12h for 3 weeks, then 10–20 mg/kg q12h for 3 weeks. (Marks 2007b)

  f) 10–25 mg/kg PO three times a day for 4–6 weeks. With resolution of clinical signs, reduce dose by 25 percent at 2 week intervals and eventually discontinue while maintaining dietary management. (Washabau 2005)

  For adjunctive treatment of vasculitis:

  a) 20–40 mg/kg PO q8h (Hillier 2006d), (Griffin 2006)

  b) 25 mg/kg PO three times a day. (Bloom 2006b)

- **CATS:**

  For inflammatory large bowel disease:

  a) 10–20 mg/kg PO once daily. Use cautiously in cats because of their sensitivity to salicylates (Jergens and Willard 2000)

  b) 10–20 mg/kg PO q24 hours (once daily) tapered to the lowest effective dose (Moore 2004), (Marks 2007b)

  c) 10–20 mg/kg PO q8–12h (maximum of 10 days) (Dimski 1995)

  d) 10–20 mg/kg PO q8–24h; up to a maximum of 10 days treatment (Krecic 2002)

- **FERRETS:**

  a) 10–20 mg/kg PO 2–3 times a day (Williams 2000)

  b) 25 mg (total dose) PO twice daily (Weiss 2002b)

Monitoring

- Efficacy
- Adverse effects, particularly KCS; Schirmer tear tests should be performed prior to therapy (and on rechecks), especially in middle-aged to older dogs
- Occasional CBC, liver function tests are warranted with chronic therapy

Client Information

- Clients should monitor for clinical signs of KCS (dry cornea, blepharospasm, bilateral mucopurulent discharge) and report them to the veterinarian immediately.

Chemistry/Synonyms

Sulfasalazine is basically a molecule of sulfapyridine linked by a diazo bond to the diazonium salt of salicylic acid. It occurs as an odorless, bright yellow to brownish-yellow fine powder. Less than 0.1 mg is soluble in 1 mL of water and about 0.34 mg is soluble in 1 mL of alcohol.

Sulfasalazine may also be known as: salazosulfapyridine, salicylazosulfapyridine, sulfasalazinum, sulphasalazine, *Azulfidine®*, *Aculfin®*, *Azulfin®*, *Colo-Pleon®*, *Pleon RA®*, *Pyralin®*, *SAS®*, *Salazine®*, *Salazopirina®*, *Salazoprin®*, *Salazopyrin®*, *Salazopyrina®*, *Salazopyrine®*, *Salisulf Gastroprotetto®*, *Salopyrine®*, *Saridine®*, *Sazo®*, *Sulazine®*, or *Ulco®*.

Storage/Stability

Sulfasalazine tablets (either plain or enteric-coated) should be stored at temperatures less than 40°C and preferably at room temperature (15–30°C, 59–86°F) in well-closed containers. The oral suspension should be stored at room temperature (15–30°C, 59–86°F); avoid freezing.

Dosage Forms/Regulatory Status

VETERINARY-LABELED PRODUCTS: None

HUMAN-LABELED PRODUCTS:

Sulfasalazine Tablets: 500 mg; *Azulfidine*® (Pfizer); (Rx); generic; (Rx)

Sulfasalazine Delayed-Release Tablets: 500 mg (enteric coated); *Azulfidine*® *EN-tabs*® (Pfizer); (Rx)

Syrup of Ipecac – see Ipecac Syrup

TAURINE

(***tor*-een**)

AMINO ACID NUTRITIONAL

Prescriber Highlights

- Amino acid used primarily for the treatment of taurine deficiency cardiomyopathies in cats & dogs
- May also be useful for many other conditions (*e.g.*, seizures), but little supporting data available
- Very low toxic potential
- Laboratory considerations

Uses/Indications

Taurine has proven beneficial in preventing retinal degeneration and the prevention and treatment of taurine-deficiency dilated cardiomyopathy in cats. Although modern commercial feline diets have added taurine, some cats still develop taurine-deficiency associated dilated cardiomyopathy. It may also be of benefit in taurine (±carnitine) deficient cardiomyopathy in American Cocker Spaniels and certain other breeds such as, Golden Retrievers, Labrador Retrievers, Newfoundlands, Dalmations, Portuguese Water Dogs, and English Bulldogs. Preliminary studies have shown evidence that it may be useful as adjunctive treatment for cardiac disease in animals even if taurine deficiency is not present. Because of its low toxicity, some have suggested it be tried for a multitude of conditions in humans and animals; unfortunately, little scientific evidence exists for these uses.

Pharmacology/Actions

While classically considered a "non-essential" nutrient, taurine has been found to play several "essential" roles in various mammalian species. Taurine is important for bile acid conjugation, especially in cats and dogs. *In vivo*, taurine is synthesized from methionine. Cysteinesulfinic acid decarboxylase (CSAD) and vitamin B_6 are involved with this synthesis. Deficiencies of either will depress taurine synthesis. Cats are particularly susceptible to taurine deficiency as they have low CSAD activity and use taurine almost exclusively for bile acid conjugation.

Additionally taurine is important in the modulation of calcium flux, thereby reducing platelet aggregation, stabilizing neuronal membranes, and affecting cardiac function. Taurine's effects on cardiac function include positive inotropic activity without affecting resting potential and modulating ionic currents across the cell membrane. Taurine is important for normal development of the CNS and it has a GABA-like effect that may make it useful for treating some seizure disorders.

Pharmacokinetics

No specific information was located. Excess taurine is rapidly excreted in the kidneys, but if a deficiency exists, urinary excretion is reduced via reabsorption.

Contraindications/Precautions/Warnings

While taurine is safe, it should not be used as a substitute for adequate diagnosis.

Adverse Effects

Taurine appears to be very well tolerated. Minor GI distress potentially could occur after oral dosing.

Overdosage/Acute Toxicity

No specific information was located, but toxic potential appears to be very low.

Drug Interactions

None are reported.

Laboratory Considerations

- Because plasma levels may reflect the acute changes associated with dosing, whole blood levels are preferred to measure actual status of taurine in the body. Because intracellular levels of taurine are much higher than in plasma, hemolysis or collection of the buffy coat will negate the results.

Doses

- **DOGS:**
  a) For taurine-deficiency related cardiomyopathy: In American Cocker Spaniels: Give 500 mg taurine PO q12h (with 1 gram of carnitine PO q12h) (Kittleson 2000)
  b) Complementary therapy for seizures: 400 mg/40 lbs of body weight PO twice daily. "May" help decrease seizure activity (Neer 2000)
- **CATS:**
  a) For taurine-deficiency related cardiomyopathy: 250 mg (per cat) PO q12–24h. Because taurine is safe and inexpensive, recommend using for any case of myocardial failure. (Fox 2000)
  b) Complementary therapy for seizures: 500 mg Per cat PO twice daily. "May" help decrease seizure activity (Neer 2000)

Monitoring

- Clinical efficacy
- Taurine levels (if possible and affordable; whole blood levels preferable to plasma/serum levels)

Chemistry/Synonyms

Taurine, an amino acid also known as 2-aminosulphonic acid, has a molecular wt. of 125. Solubility in 100 mL of water at 20°C is 8.8 grams.

Storage/Stability

Unless otherwise labeled, store taurine tablets or capsules at room temperature. Protect from light and moisture.

Dosage Forms/Regulatory Status

VETERINARY-LABELED PRODUCTS:

The following products are labeled for use in animals:

Taurine Tablets: 250 mg: *Formula V*® *Taurine Tablets* (PetAg); Labeled for use in cats.

Taurine Liquid: 375 mg/4 mL (one pump); *Dyna-Taurine*® (Harlmen); Labeled for use in dogs and cats.