# SUCRALFATE

(soo-*kral*-fate) Carafate®

GASTROPROTECTANT

## Prescriber Highlights

- Locally-acting treatment for GI ulcers; may also protect somewhat against GI ulceration. Potentially could be useful for lowering serum phosphorus in renal patients.
- Contraindications: None, use with caution where decreased GI transit times may be harmful
- Adverse Effects: Unlikely; constipation possible
- Give on empty stomach if possible
- Drug Interactions

### Uses/Indications

Sucralfate has been used in the treatment of oral, esophageal, gastric, and duodenal ulcers. It has also been employed to prevent drug-induced (*e.g.*, aspirin) gastric erosions, but efficacy for this is somewhat sporadic. Sucralfate has been used in human patients with hyperphosphatemia secondary to renal failure and potentially could be useful for this in animals as well.

### Pharmacology/Actions

While the exact mechanism of action of sucralfate as an antiulcer agent is not known, the drug has a local effect rather than a systemic one. After oral administration, sucralfate reacts with hydrochloric acid in the stomach to form a paste-like complex that will bind to the proteinaceous exudates that generally are found at ulcer sites. This insoluble complex forms a barrier at the site and protects the ulcer from further damage caused by pepsin, acid, or bile.

Sucralfate may have some cytoprotective effects, possibly by stimulation of prostaglandin $E_2$ and $I_2$. Sucralfate also has some antacid activity, but it is believed that this is not of clinical importance.

Sucralfate does not significantly affect gastric acid output, or trypsin or pancreatic amylase activity. It may decrease the rate of gastric emptying.

As an aluminum salt, sucralfate can bind to gastrointestinal phosphorus.

### Pharmacokinetics

Animal studies have indicated that only 3–5% of an oral dose is absorbed which is excreted in the urine unchanged within 48 hours. By reacting with hydrochloric acid in the gut, the remainder of the drug is converted to sucrose sulfate which is excreted in the feces within 48 hours. The duration of action (binding to ulcer site) may persist up to 6 hours after oral dosing.

### Contraindications/Precautions/Warnings

There are no known contraindications to the use of sucralfate. Because it may cause constipation, it should be used with caution in animals where decreased intestinal transit times might be deleterious.

### Adverse Effects

Adverse effects are uncommon with sucralfate therapy. Constipation is the most prominent adverse effect reported in humans (2%) and dogs receiving the drug.

### Reproductive/Nursing Safety

It is unknown if sucralfate crosses the placenta and whether it may definitively be used safely during pregnancy. In rats, dosages up to 38 times those used in humans caused no impaired fertility and doses up to 50 times normal caused no symptoms of teratogenicity. 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: ***A*** (*Probably safe. Although specific studies may not have proved he safety of all drugs in dogs and cats, there are no reports of adverse effects in laboratory animals or women.*)

It is not known whether this drug is excreted in milk, but it is unlikely to be of concern.

### Overdosage/Acute Toxicity

Overdosage is unlikely to cause any significant problems. Laboratory animals receiving up to 12 grams/kg orally demonstrated no incidence of mortality.

### Drug Interactions

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

Sucralfate may impair the oral absorption of the following medications; separate dosing by at least 2 hours to minimize this effect:

- **CIPROFLOXACIN** (assume other **oral fluoroquinolones** as well)
- **DICLOFENAC**
- **DIGOXIN**
- **KETOCONAZOLE**
- **LEVOTHYROXINE**
- **PENICILLAMINE**
- **TETRACYCLINES**
- **VITAMINS** (**fat soluble**)
- **WARFARIN**

### Doses

- **DOGS:**
  a) For esophagitis: 0.5–1 gram PO three times a day. Suspensions are more therapeutic than intact tablets. (Washabau 2000)
  b) For large dogs: 1 gram PO q8; for smaller dogs: 0.5 gram PO q8h (Zerbe and Washabau 2000)
  c) 0.5–1 gram PO 2–4 times a day; patients with severe GI blood loss give an initial loading dose of 3–6 grams and then resume lower dose. If also using an H2 blocker, administer sucralfate 30–60 minutes later. (Hall 2000)
  d) For eliminating Helicobacter gastritis infections: Using triple therapy: Metronidazole 33 mg/kg once daily, amoxicillin 11 mg/kg q12h and either sucralfate (0.25–0.5 grams q8h) or omeprazole 0.66 mg/kg once daily (Hall 2000)
  e) In patients with severe hematemesis and anemia we sometimes give a loading dose of 3–6 grams initially and then decrease to 1 gram PO three to four times a day. May not always work in vomiting dogs. Suspensions may have less tendency to be vomited up in these patients. (Willard 2006d)
  f) For gastric ulcers, esophagitis: 0.5–1 gram PO per dog q8–12h (Sellon 2007b)

g) For GI ulcers/esophagitis associated with acute renal failure: 1 gram per 30 kg body weight PO q6h (Waddell 2007a)

- **CATS:**
  a) 0.25–0.5 grams PO q8–12h (Zerbe and Washabau 2000)
  b) 0.25 gram PO q8–12h (Matz 1995)
  c) For gastric ulcers, esophagitis: 0.25–0.5 grams PO per cat PO q8–12h (Sellon 2007b)
- **FERRETS:**
  a) 75 mg/kg PO q4–6h; give 10 minutes prior to feeding (Williams 2000)
- **HORSES:**
  a) For adjunctive treatment for preventing stress-induced ulcers in foals: 10–20 mg/kg PO q6–8h (Sanchez 2004b)
  b) For treating equine gastric ulcer syndrome: 20–40 mg/kg PO q8h (Sanchez 2004b), (Nadeau and Andrews 2003)
- **REPTILES:**
  a) For GI irritation in most species: 500–1,000 mg/kg PO q6–8h (Gauvin 1993)

### Monitoring

- Clinical efficacy (dependent on reason for use); monitored by decrease in symptomatology, endoscopic examination, blood in feces, etc.

### Client Information

- To maximize the benefit of this medication, it must be administered as prescribed by the veterinarian; clinical signs may reoccur if dosages are missed
- Unless otherwise instructed, give this medication to animal having an empty stomach (1 hour before feeding or 2 hours after) and at bedtime

### Chemistry/Synonyms

A basic, aluminum complex of sucrose sulfate, sucralfate occurs as a white, amorphous powder. It is practically insoluble in alcohol or water.

Sucralfate is structurally related to heparin, but does not possess any appreciable anticoagulant activity. It is also structurally related to sucrose, but is not utilized as a sugar by the body.

Sucralfate is also known as aluminum sucrose sulfate, basic and *Carafate*®.

### Storage/Stability

Store sucralfate tablets in tight containers at room temperature.

### Dosage Forms/Regulatory Status

**VETERINARY-LABELED PRODUCTS:** None

**HUMAN-LABELED PRODUCTS:**

Sucralfate Tablets: 1 gram (scored); *Carafate*® (Axcan Sandipharm); generic; (Rx)

Sucralfate Suspension: 1 g/10 mL in 10 mL unit dose cups & 415 mL; *Carafate*® (Axcan Scandipharm); generic (Precision Dose); (Rx)

## SUFENTANIL CITRATE

(soo-*fen*-ta-nil) Sufenta®

OPIATE AGONIST

### Prescriber Highlights

- Injectable, extremely potent opiate that may be useful for adjunctive anesthesia or epidural analgesia
- Marginal veterinary experience & little published data available to draw conclusions on appropriate usage in veterinary species
- Dose-related respiratory & CNS depression most likely adverse effects
- Class-II controlled substance; expensive when compared to fentanyl

### Uses/Indications

An opioid analgesic, sufentanil may be useful as an anesthesia adjunct or as an epidural analgesic. In humans, it has been used as the primary anesthetic in intubated patients with assisted ventilation, and as a post-operative analgesic.

### Pharmacology/Actions

Sufentanil is a potent *mu* opioid with the expected sedative, analgesic, and anesthetic properties. When comparing analgesic potencies, 0.01–0.04 mg of sufentanil is equivalent to 0.4–0.8 mg of alfentanil, 0.1–0.2 mg of fentanyl, and approximately 10 mg of morphine, when all are injected IM. Like fentanyl, sufentanil appears to have less circulatory effects than does morphine. Sufentanil has a rapid onset of action (1–3 minutes) and a faster recovery time than fentanyl.

### Pharmacokinetics

No information on the pharmacokinetics of sufentanil in domestic animals was located. In humans, the drug has rapid onset of action (1–3 minutes) after intravenous injection. The drug is highly lipid soluble and has volume of distribution in the central compartment of 0.1 L/kg. Approximately 93% is bound to plasma proteins; plasma concentrations rapidly decline due to redistribution. Terminal elimination half-life is about 2.5 hours. Plasma clearance has been reported to be 11.8 mL/min/kg. Sufentanil is metabolized primarily in the liver and small intestine via O-demethylation and N-dealkylation. The parent drug and these metabolites are excreted primarily in the urine. While the manufacturer states to use with caution in patients with impaired renal of hepatic function, limited pharmacokinetic studies in these patients, rarely showed any drug accumulation.

### Contraindications/Precautions/Warnings

Sufentanil is contraindicated in patients hypersensitive to it or other opioids. It should be used with caution in debilitated or geriatric patients and those with severely diminished renal or hepatic function.

Because of the drug's potency and potential for significant adverse effects, it should only be used in situations where patient vital signs can be continuously monitored. Initial dosage reduction may be required in geriatric or debilitated patients, particularly those with diminished cardiopulmonary function.