Top 5 Recommendations for Using Acid Suppressants Effectively

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Healing of acid-related disorders (eg, GI ulceration, reflux esophagitis, stress gastritis) is dependent on raising gastric pH. In humans, proton pump inhibitors (PPIs) have demonstrated superior efficacy in treating these disorders.[1,2] Only in the past decade have PPIs been identified as superior acid suppressants as compared with histamine-$_2$ receptor antagonists (H_2RAs) for dogs[3] and cats.[4,5]

Oral omeprazole, a PPI, is available in several formulations and can be dosed for various body weights, which makes it a practical and readily available choice for prolonged therapy. Therefore, it is reasonable to expect that this class of acid suppressants may begin to surpass H_2RAs such as famotidine and ranitidine for treating acid-related disorders. Because of the wide range of underlying diseases or conditions that are thought to lead to gastric hyperacidity and/or GI ulceration (eg, chronic kidney disease, inflammatory bowel disease, mast cell tumor, gastric adenocarcinoma, gastric lymphoma), a complete understanding of proper administration of oral PPIs is imperative.

TOP 5 RECOMMENDATIONS FOR USING ACID SUPPRESSANTS EFFECTIVELY

1. Dosage Recommendations
2. Frequency
3. Formulations
4. Timing with Meals
5. Concurrent Administration with Histamine-$_2$ Receptor Antagonists

H_2RA = histamine-$_2$ receptor antagonist

PPI = proton pump inhibitor

Following are the authors' top 5 guidelines for efficacious use of oral PPIs.

1 Dosage Recommendations

Until recently, studies on the use of acid suppressants in dogs and cats were limited. Therefore, the recommended dosing for oral PPIs (eg, omeprazole) was anecdotal. Published doses for both cats and dogs are 0.7-1.5 mg/kg PO q24h for reflux esophagitis and 0.5-1 mg/kg PO q24h for GI ulceration.[6] Recent studies have evaluated the efficacy of H_2RA and PPI therapy in small animals using novel technology to continuously monitor intragastric pH. In healthy cats, 1 mg/kg omeprazole PO q24h was more effective at raising intragastric pH than was famotidine (1 mg/kg PO q12h)[4] or ranitidine (1-2 mg/kg PO q12h).[5] In humans, only omeprazole at 1 mg/kg PO q12h achieved goals established for treating gastric-acid–induced tissue injury. Similar studies in dogs also demonstrated the superior efficacy of omeprazole (1 mg/kg q12h) as compared with famotidine (1 mg/kg q12h).[3]

These results suggest that standard dosing recommendations for omeprazole should be changed to 1 mg/kg PO q12h for adjunctive treatment of conditions known to cause ulcerative GI disease in companion animals (eg, mastocytosis, gastrinoma, NSAID toxicity) or reflux esophagitis. Further studies are needed to evaluate the recommended acid suppressant of choice in treating chronic diseases suspected to lead to gastric hyperacidity (eg, chronic renal or hepatic disease).

2 Frequency

For oral omeprazole, q12h dosing has been found to be superior to q24h dosing in healthy cats[5]; moreover, studies in dogs suggest that 2 mg/kg q24h may be less effective than the same total daily dose divided over 2 doses (ie, 1 mg/kg q12h).[3,7] Only q12h dosing has been shown to raise intragastric pH in dogs and cats to a level associated with healing duodenal ulcers and gastroesophageal reflux in humans.[3-5,7,8] Therefore, 1 mg/kg q12h is recommended for omeprazole when treating ulcerative disease in dogs and cats. Further studies are needed to determine if q12h or q24h dosing is optimal for other disorders thought to predispose dogs and cats to gastric hyperacidity (eg, renal disease, hepatic dysfunction).

3 Formulations

The availability of many omeprazole formulations can complicate selection of the appropriate choices. Over-the-counter omeprazole formulations include tablets widely available in 20-mg and 40-mg sizes. A recent study demonstrated that generic enteric-coated omeprazole tablets can be divided and given to cats.[4] Despite disruption of the enteric coating, the divided tablet was still an effective acid suppressant and was superior to famotidine at 1 mg/kg PO q12h.[4] This finding allows for more appropriate over-the-counter PPI dosing in cats. A reformulated omeprazole paste for treating equine ulcers is also available (GastroGard, merial.com). The paste, diluted to a concentration of 10-40 mg/mL in cod liver or corn oil, was as efficacious as other oral formulations for raising canine and feline intragastric pH.[3,4] This formulation may be a good option for cats or dogs intolerant of oral administration of capsules or tablets. Moreover, the paste is a concentrated preparation and allows for administration of liquids at greatly reduced doses as compared with the available liquid formulations. Human-labeled oral suspensions may contain xylitol, which should not be administered to canine patients.

4 Timing with Meals

Omeprazole, like other PPIs, acts to reduce meal-stimulated gastric acid secretion. Thus, the current recommendation for PPI administration is to administer the drug 30 minutes before a meal so the medication is at peak effect when the patient is fed. However, in a recent study, omeprazole

administered to cats with a small food bolus was effective.[5] This may be an easier option for medicating cats, but PPI administration before a meal is recommended for dogs and cats that are easy to pill.

5 Concurrent Administration with Histamine-$_2$ Receptor Antagonists

No evidence exists in the literature for or against concurrent use of oral H_2RAs and PPIs. In one study, simultaneous administration of IV famotidine and pantoprazole in dogs did not have superior acid suppression as compared with pantoprazole alone.[8] No such studies exist for cats. Because PPIs have a loading phase that takes up to 48 to 72 hours for maximal effects, many clinicians still believe in administering an H_2RA concurrently with a PPI for 48 to 72 hours while the PPI reaches maximal effect. However, there is no evidence for this practice, and some pharmacologists believe that concurrent administration of an H_2RA and PPI may result in diminished efficacy of the PPI. Thus, the authors do not recommend this practice for the treatment of ulcerative disease or reflux esophagitis in dogs and cats.

H_2RA = histamine-$_2$ receptor antagonist

PPI = proton pump inhibitor

Conclusion

Efficacious use of acid suppressants is dependent on dose, frequency, and the underlying disorder. Studies have emerged in the human literature documenting serious adverse events secondary to chronic PPI therapy, including increased risk for development of enteric (eg, *Clostridium difficile*) and respiratory infections[9,10] and hypomagnesemia[11] as well as for fractures in older patients and postmenopausal women.[12,13] There has been FDA communication regarding both increased susceptibility to infections and hypomagnesemia recommending that any patient that develops these be immediately withdrawn from PPI therapy. Because there is only one published report investigating dysbiosis secondary to short-term omeprazole therapy in dogs,[14] further studies are needed to determine if companion animals receiving PPIs are at risk for infections. Evidence of potentially life-threatening adverse events in humans secondary to long-term PPI therapy warrants further investigation to assess the benefits and risk for long-term therapy in dogs and cats. Judicious use of these medications is warranted.

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