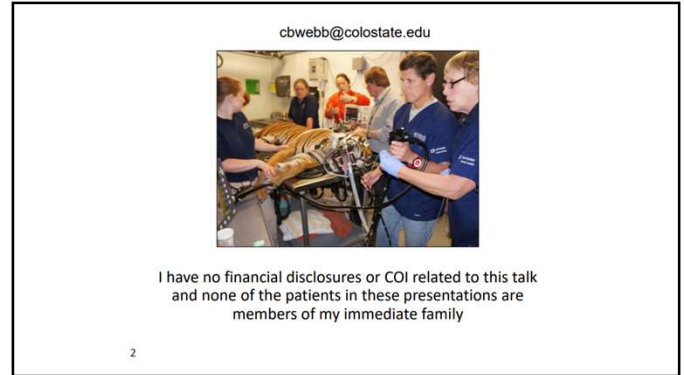
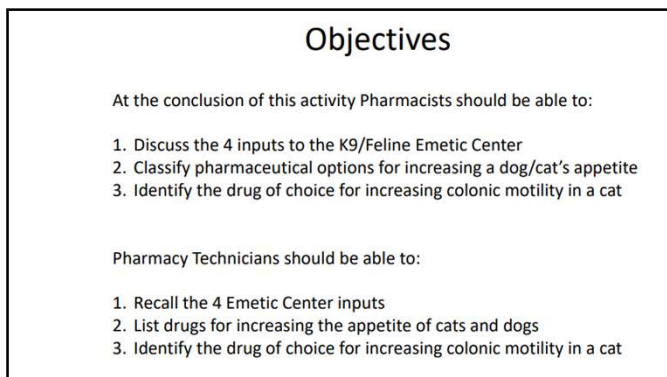


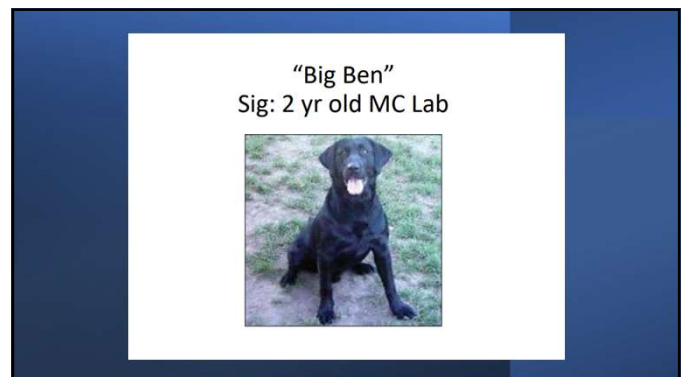
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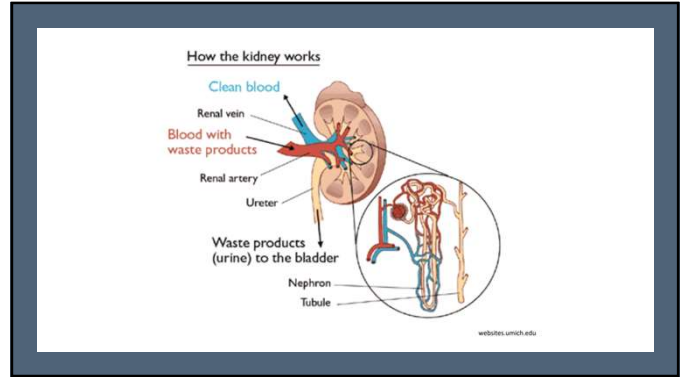
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6

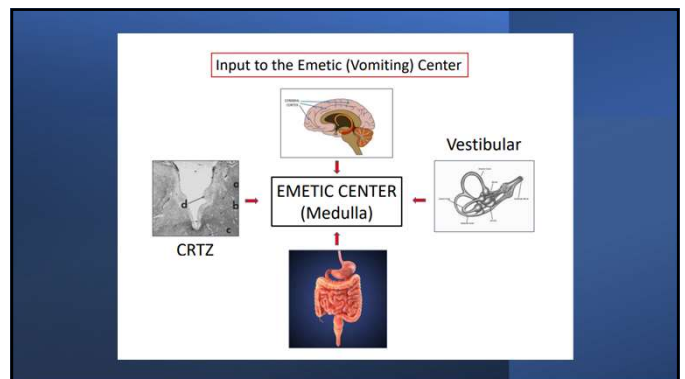
The Thought Process

"I need a quick and easy way to get the stuff inside this dog's stomach out of it's stomach"

💡 "Let's make the dog vomit!"

To pull that off, we need to understand what normally makes a dog vomit.

7



8

Time to Assess Yourself

1. Cats rarely suffer from vertigo, but they frequently develop Chronic Kidney Disease (CKD) as they age. Which input to the Emetic Center would be responsible for causing a CKD cat to vomit in response to uremic toxins?

- a. Cerebral cortex
- b. Vestibular apparatus
- c. Chemoreceptor Trigger Zone
- d. Gastrointestinal Tract

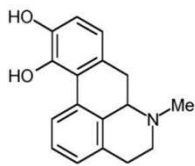
9

Emetic Center Input

- Chemoreceptor Trigger Zone (CRTZ)*
 - Drugs, toxins, pH, metabolites
- Cerebral Cortex
 - Scary movies, gross visuals, smells, thoughts
- Vestibular apparatus
 - Motion sickness, vestibular disease, inner ear infections
- GI tract
 - Inflammation, irritation, stimulation, constipation

10

Apomorphine



11

Apomorphine

Apomorphine
D₂ agonist
K-9 Emetic

Dopaminergic Receptor

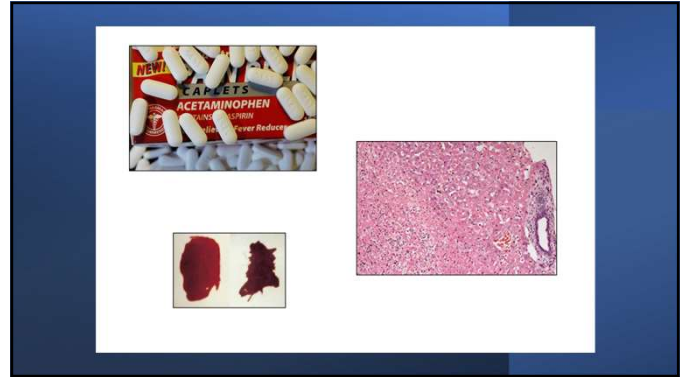
Chemoreceptor Trigger Zone
 D₂, α₂, 5-HT₃, M₁, NK₁, ENK_{1/2}

D₂ = Dopaminergic
 H₁ = Histaminergic
 α₂ = Adrenergic
 5-HT₃ = Serotonergic
 M₁ = Muscarinic (ACh)
 ENK_{1/2} = Enkephalinergic
 NK₁ = Neurokinergic

12



13



14

Apomorphine in Cats

- ▶ “Use of apomorphine in cats is controversial and many recommend not using in this species.”

- Plumb pg. 86

15

Dopaminergic Receptor

Chemoreceptor
Trigger Zone

~~D₂~~ H₁ α₂ 5-HT₃ M₁
NK₁ ENK_{μ,γ}

16

KEY CLINICAL CONCEPT

Read up on the mechanisms and side effects of drugs **BEFORE** you administer them.



<https://beta.vin.com/>

17

> Vet Rec. 2020 Mar 7;186(9):283. doi: 10.1136/vr.104953. Epub 2019 Aug 13.


Ropinirole eye drops induce vomiting effectively in dogs: a randomised, double-blind, placebo-controlled clinical study

Vet Record Minna Suokko ¹, Lasse Saloranta ², Terttu Lamminen ², Tarmo Laine ², Jonathan Elliott ³

Affiliations + expand
PMID: 31409749 PMCID: PMC7063390 DOI: 10.1136/vr.104953

18

"Rae" 2 month old FI Eng Bulldog
PC: vomiting & smelly diarrhea



liffiesbulldogs.com

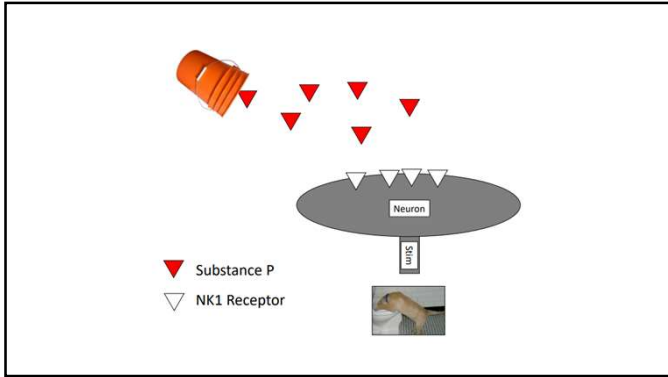
19

Chemoreceptor Trigger Zone

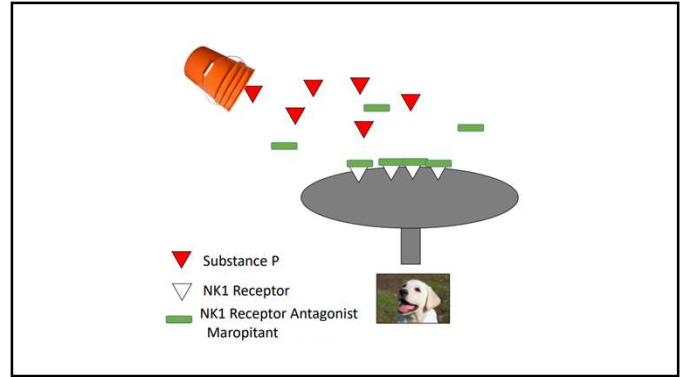
D₂ H₁ α₂ 5-HT₃ M₁
NK₁, ENK_{μ,γ}

D₂ = Dopaminergic
H₁ = Histaminergic
α₂ = Adrenergic
5-HT₃ = Serotonergic
M₁ = Muscarinic (ACh)
ENK_{μ,γ} = Enkephalinergetic
NK₁ = Neurokinergic

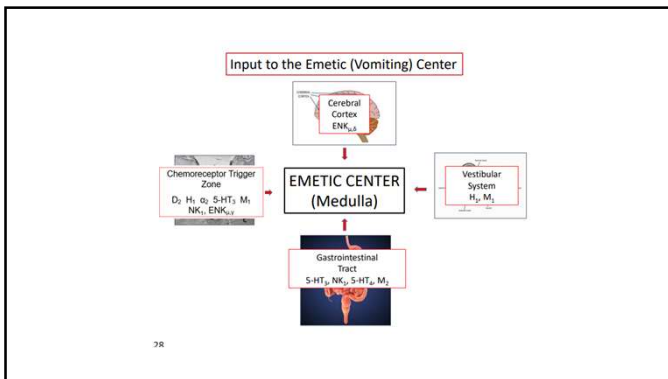
20



21



22



23

“Fred” 5 yo MC Orange Tabby
 PC: Not eating, drooling

24

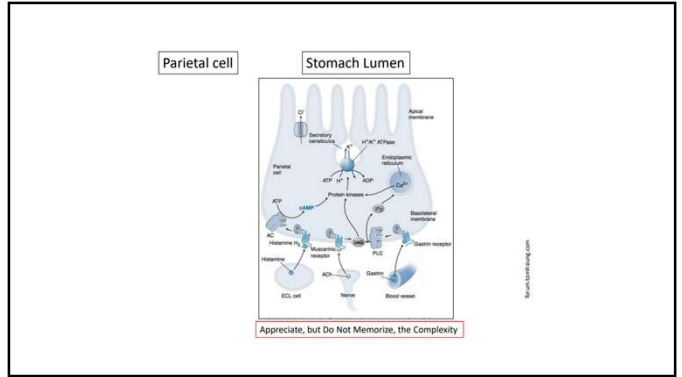
nau·se·a
 /'nóʒeə, 'nóʒHə/ (n)
 noun
 a feeling of sickness with an inclination to vomit.
 synonym: sickness, biliousness, queasiness. More

Ettinger 8th edition, INDEX, "Nausea and vomiting. See also Vomiting"

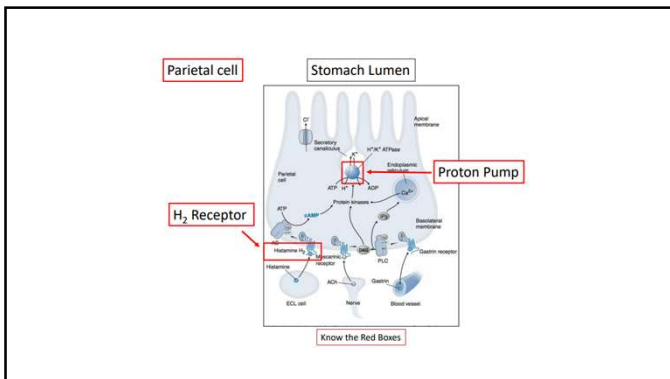
How do you make nausea go away?

1. Why it happens. Nausea is that awful, queasy feeling you get in your stomach that makes you feel like you're going to vomit. ...
2. Sit up and avoid crunching the stomach. ...
3. Open a window or sit in front of a fan. ...
4. Apply a cool compress. ...
5. Apply pressure. ...
6. Meditate or take deep breaths. ...
7. Shift your focus. ...
8. Stay hydrated.

25



26



27

Reduce Gastric Acid

| | |
|---|--|
| <p>Famotidine</p> <ul style="list-style-type: none"> • H2 Receptor Antagonist | <p>Omeprazole</p> <ul style="list-style-type: none"> • Proton Pump Inhibitor |
|---|--|


28

 Efficacy of oral famotidine and 2 **omeprazole** formulations for the control of intragastric pH in dogs.
Tolbert K, Bissett S, King A, Davidson G, Papich M, Peters E, Degernes L.
J Vet Intern Med. 2011 Jan-Feb;25(1):47-54. doi: 10.1111/j.1939-1676.2010.0651.x. Epub 2010 Dec 8.

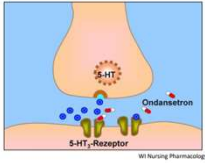
 Evaluation of proton pump inhibitor administration in hospitalized dogs in a tertiary referral hospital.
Duxbury S, Sorah E, Tolbert MK.
J Vet Intern Med. 2022 Sep;36(5):1622-1627. doi: 10.1111/jvim.16491. Epub 2022 Jul 22.

 Evaluation of a long-acting injectable formulation of **omeprazole** in healthy dogs.
Oduwayo A, Galyon G, Price J, Hecht S, Tolbert MK.
J Vet Intern Med. 2022 Jul;36(4):1416-1421. doi: 10.1111/jvim.16440. Epub 2022 May 12.

29


 J Vet Pharmacol Ther. 2022 Nov;45(6):508-515. doi: 10.1111/jvp.13087. Epub 2022 Jul 28.

Pharmacokinetics and anti-nausea effects of intravenous ondansetron in hospitalized dogs exhibiting clinical signs of nausea
Cindy K Sobole ¹, Sarah B Shropshire ¹, Jessica Quimby ², Sydney Stegson ³, Daniel L Gustafson ³, Kristin M Zensen ¹
Affiliations + expand


WuXiang Pharmacology



30

"Mr. Fatty" 6yo MC DSH
PC: Anorexia, Weight-loss, Vomiting
PE: Icteric



31

"Not eating is not normal for cats"

Dr. Tony Buffington

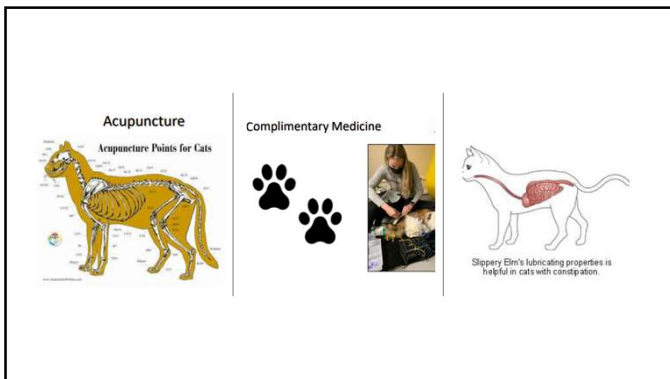
32



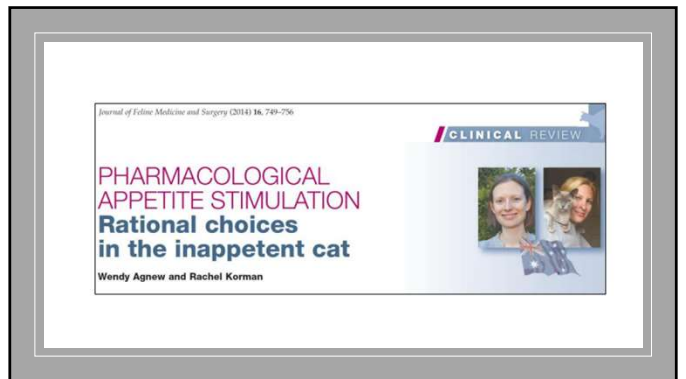
33



34



35



36

Cyproheptadine



- Antihistamine
- Appetite stimulant
- Serotonin antagonist

37

Mirtazapine

- Appetite stimulant
- Anti-anxiety, antidepressant
- Improves rats performance on sexual motivation tests
- Anti-emetic (Anti-nausea)
 - 5-HT3 antagonist
- Remeron SolTab (avail as generic, 15mg)
- **OLD DOSE** was 3 mg/cat PO q72h

38



Dr. Quimby

The Importance of Pharmacology Research to Clinical Veterinarians

Mirtazapine as an appetite stimulant and anti-emetic in cats with chronic kidney disease: a masked placebo-controlled crossover clinical trial.
 Quimby JM, Lunn KF. *Vet J*. 2013 Sep;197(3):651-5. doi: 10.1016/j.tvjl.2013.05.048. Epub 2013 Jul 6.

The pharmacokinetics of mirtazapine in cats with chronic kidney disease and in age-matched control cats.
 Quimby JM, Gustafson DL, Lunn KF. *J Vet Intern Med*. 2011 Sep-Oct;25(5):985-9. doi: 10.1111/j.1939-1676.2011.00780.x. Epub 2011 Aug 30.

Studies on the pharmacokinetics and pharmacodynamics of mirtazapine in healthy young cats.
 Quimby JM, Gustafson DL, Samber BJ, Lunn KF. *J Vet Pharmacol Ther*. 2011 Aug;34(4):388-96.



Dr. Gustafson

39

Mirtazapine

- Remeron SolTab (avail as generic, 15mg)
- ~~~3 mg/cat PO q72h~~
- 1/8th tab/cat PO q24h (1.87 mg)
- 1/8th tab/cat PO q48h in cats with CRF!


40

Mirtazapine toxicity in cats: Retrospective study of 104 cases (2006-2011)
 Ferguson & Quimby ACVIM Abstract 2014

- Occurs Most Frequently at ¼ tab (3.75mg) dose
- Usually reversible with discontinuation

Serotonin syndrome

- Vocalizing
- Hyperactivity
- Agitation
- Tachycardia



41

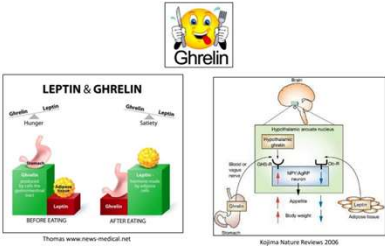
PHARMACOKINETICS AND PHARMACODYNAMICS OF TRANSDERMAL MIRTAZAPINE IN PURPOSE-BRED CATS
 © 2008 2005
 Kelly Benson, Lara Barros, Paul Longhofer, Ryan Hansen, Luke Wittenburg, Don Gustafson, Jessica Quimby
Journal of Feline Medicine and Surgery 2008; 22: 566-574



Daily 7.5 mg Transdermal produced same concentration as 1.87 mg oral and significantly increased appetite in Purpose-Bred and Healthy Client-Owned Cats

42

LEPTIN & GHRELIN



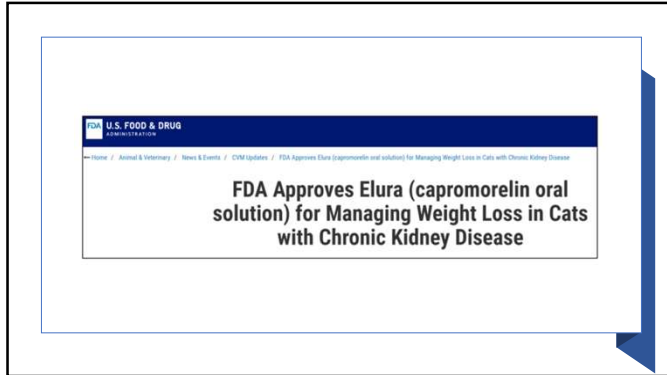
Ghrelin, the "Hunger Hormone"

43

CAPROMORELIN, AN ORALLY ACTIVE GHRELIN AGONIST, CAUSED SUSTAINED INCREASES IN IGF-1, INCREASED FOOD INTAKE AND BODY WEIGHT IN CATS

ACVIM 2015
 Bill Zollers, Julie Allen, Chelsey Kennedy, Linda Rhodes
 Anafana Therapeutics, Inc., Kansas City, KS, USA

44



45

Time to Assess Yourself

2. In cats, a period of anorexia may result in a condition known as Hepatic Lipidosis and negatively impact a cat's return to health. Which of the following is the "Hunger Hormone" for which a synthetic analog serves as an appetite stimulant for dogs and cats?

- a. Ghrelin
- b. Somatostatin
- c. CCK
- d. Motilin

46

Original Article

Appetite-stimulating effect of gabapentin vs mirtazapine in healthy cats post-ovariectomy

Marco Fantinati¹, Julien Trnka¹, Amélie Signor¹, Séverine Dumond², Géraldine Jourdan², Patrick Verwaerde² and Nathalie Priymenko¹

Journal of Feline Medicine and Surgery, 2020, vol. 28(10) 1176-1183
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DOI: 10.1177/1098611320916391
journals.sagepub.com/home/jfm
This paper was handled and processed by the European Editorial Office (EEO) for publication in JFMS

SAGE

Conclusions and relevance Cats receiving gabapentin ate more than cats in the placebo group. Thirty percent of cats in the gabapentin group covered their resting energy requirements, while none of the cats in the placebo group did. Gabapentin and mirtazapine produced similar effects on food intake.

47

J. Am. Vet. Med. Assoc., 1996 Aug 1;209(3):618-25.

Fulminant hepatic failure associated with oral administration of diazepam in 11 cats.

Center SA¹, Eskin TJ¹, Rowland PH¹, Baxter DS¹, Roth DL¹, Bunt JE¹, Rosta LJ¹, House J¹, Burt S¹, Lenth LB¹, Collins LS¹, Leo JA¹

• Oral Diazepam


Fixes for finicky felines and picky pooches

Whether a pet has just had a major operation or it has suddenly stopped happily eating whatever drops into its food bowl, Dr. Deborah Linder has a few tricks up her sleeve to help bring that appetite back.


Aug 08, 2017
By Deborah Linder, DVM, MS, DACVN
VETTED

>> Appetite stimulants: These are best used in low-risk patients that have "forgotten" their appetite and need a jump start. The effects of many of these medications are short-term. Be cautious of pets that eat voraciously for one meal after receiving an appetite stimulant but then return to hyporexia or anorexia within 12 to 24 hours. Examples of medications you can use include diazepam, cyproheptadine and mirtazapine. One new medication on the market, capromorelin, has potential long-term applications, though further clinical studies are warranted.

48


"REX" - 8 yr MC Orange Tabby
 Presented to the rDVM

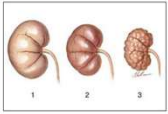

- CC: Vomiting (decreased appetite)
 - Moderately dehydrated
 - Azotemic, Low Urine Spec Grav
 - Mildly elevated liver enzymes
- PE
 - Overweight
 - Small kidneys
 - Abdominal palpation: Firm stool



49

"REX" - 8 yr MC Orange Tabby
 rDVM Diagnosis

Chronic Kidney Disease

50

A CONSTIPATED CAT!



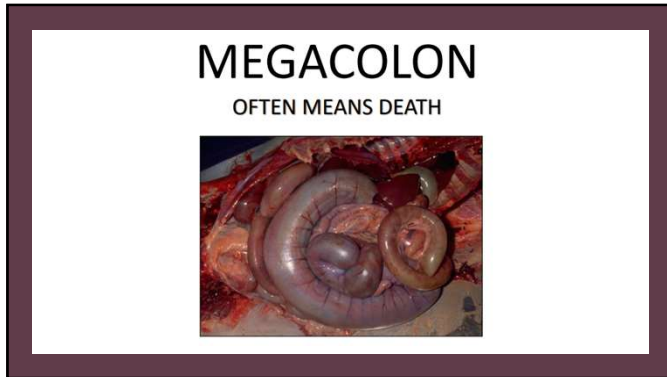
51

Megacolon


- Recurrent constipation to obstipation to Megacolon
- Generalized dysfunction of colonic smooth muscle
- Poorly Responsive to Therapy



52



53

Original Article  

Retrospective evaluation of risk factors and treatment outcome predictors in cats presenting to the emergency room for constipation

Sarah E Benjamin  and Kenneth J Drobatz

Risk Factors
Older
Overweight
CKD
Previous episode


Journal of Feline Medicine and Surgery
2020, Vol. 25(2) 103-107
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This journal was founded and published
by the American Editorial Office (AAEP)
for publication in JFMS
SAGE


54

Osmotic laxative therapy


| | |
|--------------------------------|--------------------------------|
| Lactulose | Polyethylene glycol (PEG) 3350 |
| Syrup: 0.5 mL/kg BID-TID | ¼ teaspoon BID in food |
| Powder: ¼ teaspoon BID in food | ¼ teaspoon BID in food |

55

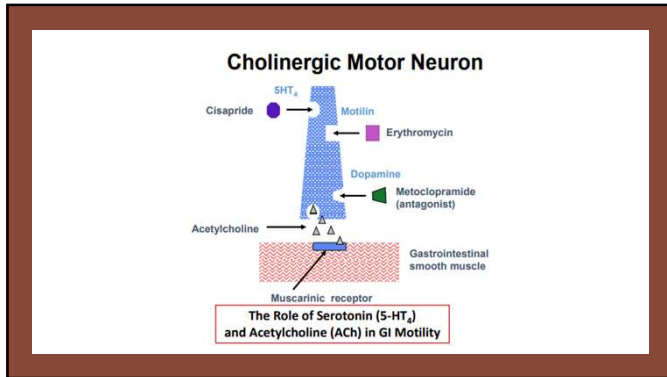
Trickle feed osmotic laxative 



Polyethylene glycol solution (PEG 3350)
• 6-10 mL/kg/hour



56



57

Time to Assess Yourself

3. Repeated bouts of constipation/obstipation in a cat may result in a condition known as "Megacolon"; this may require surgical removal of a portion of the colon, or lead to the cat's euthanasia. The drug of choice for increasing colonic motility in a cat's colon is what?

a. Diazepam
 b. Cisapride
 c. Maropitant
 d. Mirtazapine

58

Prokinetic drug of choice for moving a cat's colon

Cisapride

- 1.25-7.5 mg/cat, BID-TID, with food
- Veterinary compounding pharmacies

★ Hasler et al. JVIM 1997 Cisapride stimulates contraction of idiopathic megacolon smooth muscle in cats

59

Special Thanks!
CSU VTH Pharmacist Extraordinaire!

Tara Marmulak

60