

*The “INS” and “OUTS” of
Kitten Diarrhea*

Dr. Jill Kitson

ACFA Annual Meeting

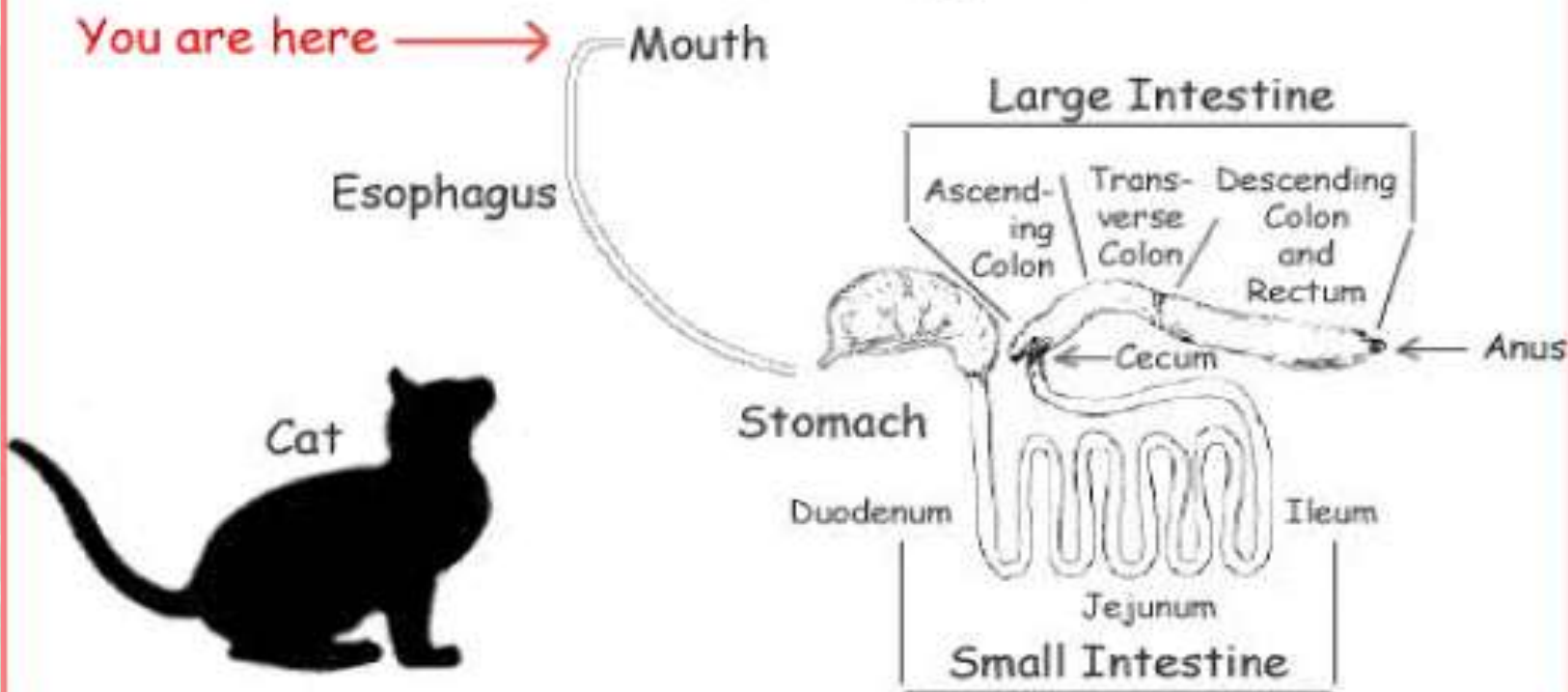
August 17, 2012



Outline

- ❖ Anatomy of Gastrointestinal Tract
- ❖ Common Causes of Kitten Diarrhea
 - Infectious - Parasites, Viral, or Bacterial
 - Nutritional - Dietary Change
 - Mechanical - Intussusception, Foreign Body, or Congenital Malformation
- ❖ Diagnosis
- ❖ Treatment
- ❖ Prevention

Cat's Digestive Tract



Overview

- ❖ Diarrhea is one of the most common health problems of kittens and young cats
- ❖ Ranges from mild and self limiting to severe, explosive, and life threatening

Classification

- ❖ Acute
 - Lasts 2-3 weeks
- ❖ Serious
 - Dehydration & Lethargy
 - Weight Loss of at least 10% body weight
- ❖ Small Bowel
 - Larger Volume of Stool
 - Trips to litter box only slightly increased
 - Normal or Dark Stool
 - No mucous Present
 - Weight loss very common
 - Straining not common
- ❖ Chronic
 - Lasts Longer than 3 weeks
- ❖ Non-Serious
 - Eating, Active, Hydrated
 - Maintaining Weight
- ❖ Large Bowel
 - Decreased Volume of Stool
 - Trips to litterbox >5 times normal
 - Normal Stool or Bright Red Blood Present
 - Mucous may be present
 - Strain to defecate without producing stool

Infectious Causes

❖ Parasitic

- Giardia
- Tritrichomonas
- Cryptosporidium
- Roundworms & Hookworms
- Coccidia

❖ Viral Causes

- Feline Panleukopenia
- Enteric Coronavirus
- FeLV

❖ Bacterial

- Salmonella
- Clostridium perfringens
- Campylobacter
- Clostridium difficile

Cat's Digestive Tract

You are here →

Mouth

Esophagus

Large Intestine

Ascending Colon
Transverse Colon
Descending Colon and Rectum

Cecum

Anus

Stomach

Roundworms
hookworms

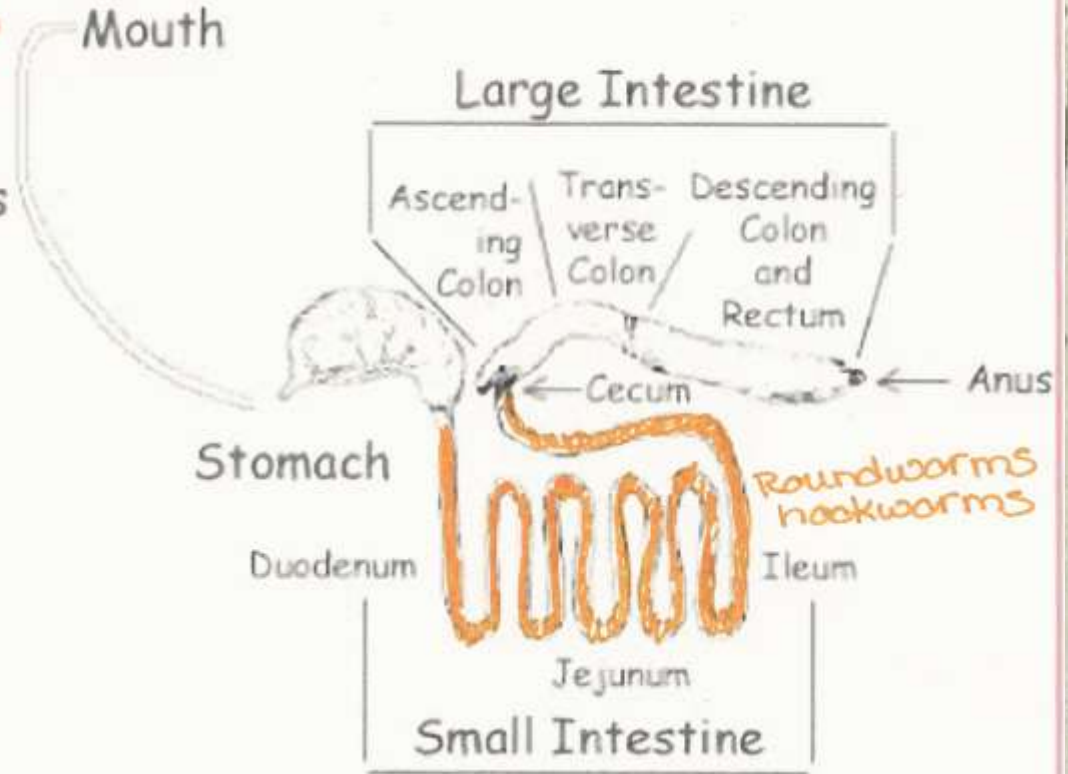
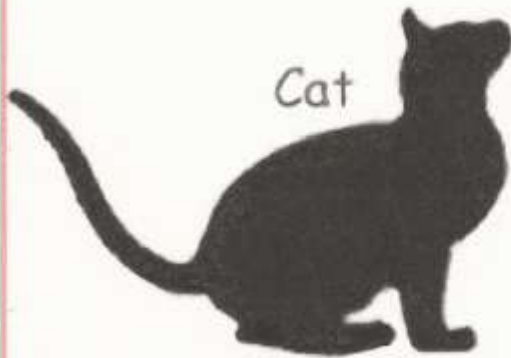
Duodenum

Ileum

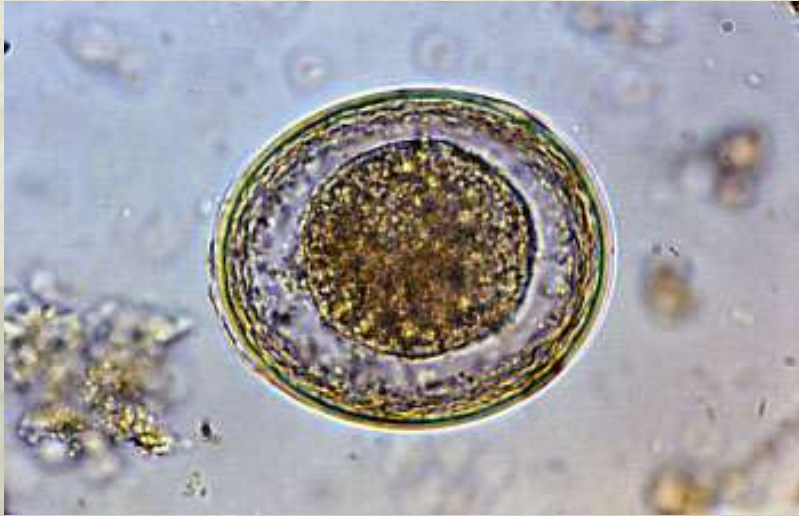
Jejunum

Small Intestine

Cat



Roundworms



- ❖ *Toxascaris leonina*
- ❖ *Toxocara cati*
- ❖ Infect cats at all stages in life
- ❖ Seen in up to 25% of cats



Toxocara spp. Adult

Roundworms

- ❖ Unlike dogs, cats are exposed after birth from a contaminated environment and not in-utero or through milk
- ❖ Pot bellied with doughy bellies, poor doers
- ❖ Round worms - start to see infections around 6-8 weeks



Hookworms

- ❖ *Ancylostoma tubaeforme*
- ❖ *Ancylostoma braziliense*
- ❖ Severe anemia with hookworms
- ❖ Hookworms - see as early as 2 weeks



Ancylostoma

Diagnosis

- ❖ Fecal Flotation
 - Try to get fresh sample
 - Easily identified
- ❖ Even if not shedding still need treated



Treatment & Prevention

- ❖ Use pyrantel pamoate at 2, 4, 6, & 8 weeks of age on Kittens and Queens
- ❖ Consult with your Veterinarian for dosing
- ❖ Remove feces daily to prevent re-infection
- ❖ Round worms are very hardy in the environment

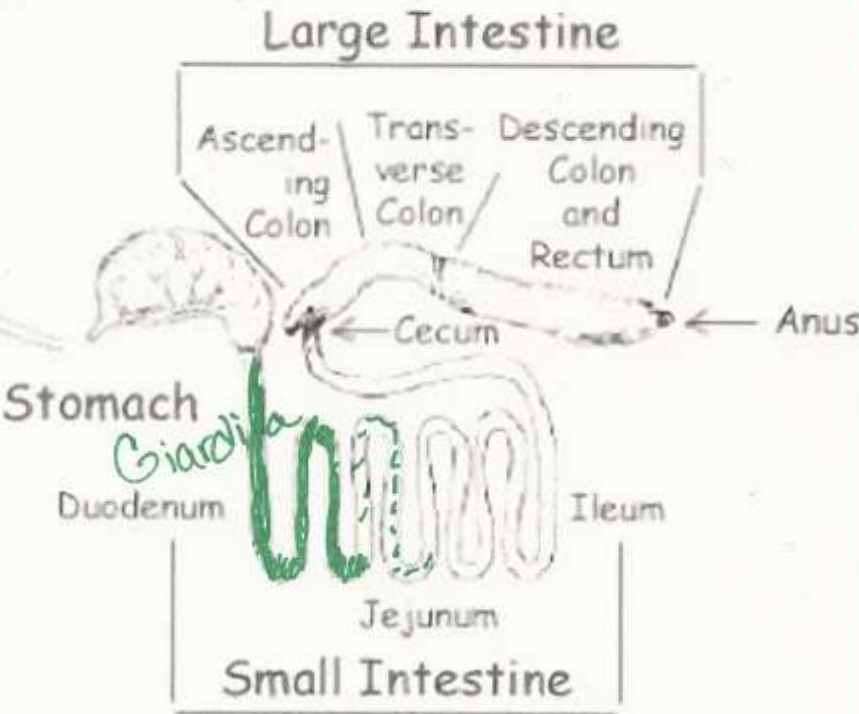
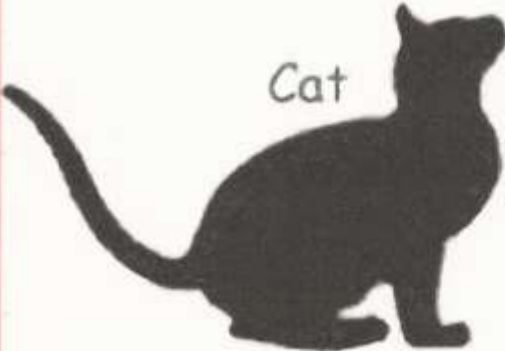


Cat's Digestive Tract

You are here →

Mouth

Esophagus



Giardia, Giardia, Giardia!!!

- ❖ Acute Onset
- ❖ Malodorous, pale, & mucoid diarrhea
- ❖ May not see diarrhea in adult cats
- ❖ Contaminated water sources
- ❖ Seen in up to 12% of catteries



Courtesy of Center
Of Disease Control

Diagnosing Giardia

Companion Animal Parasite Council recommends a combination of the following tests to help aid in diagnosis

- ❖ Zinc Sulfate Fecal Flotation via Centrifugation
- ❖ Direct Fecal Smear



- ❖ Giardia ELISA Test
 - Tests for presence of Giardia proteins present in feces
 - Very Sensitive and Specific for Giardia

- Due to intermittent shedding can have many false negative samples
- Recommend to attain samples from 3 or more consecutive days

Treating Giardia

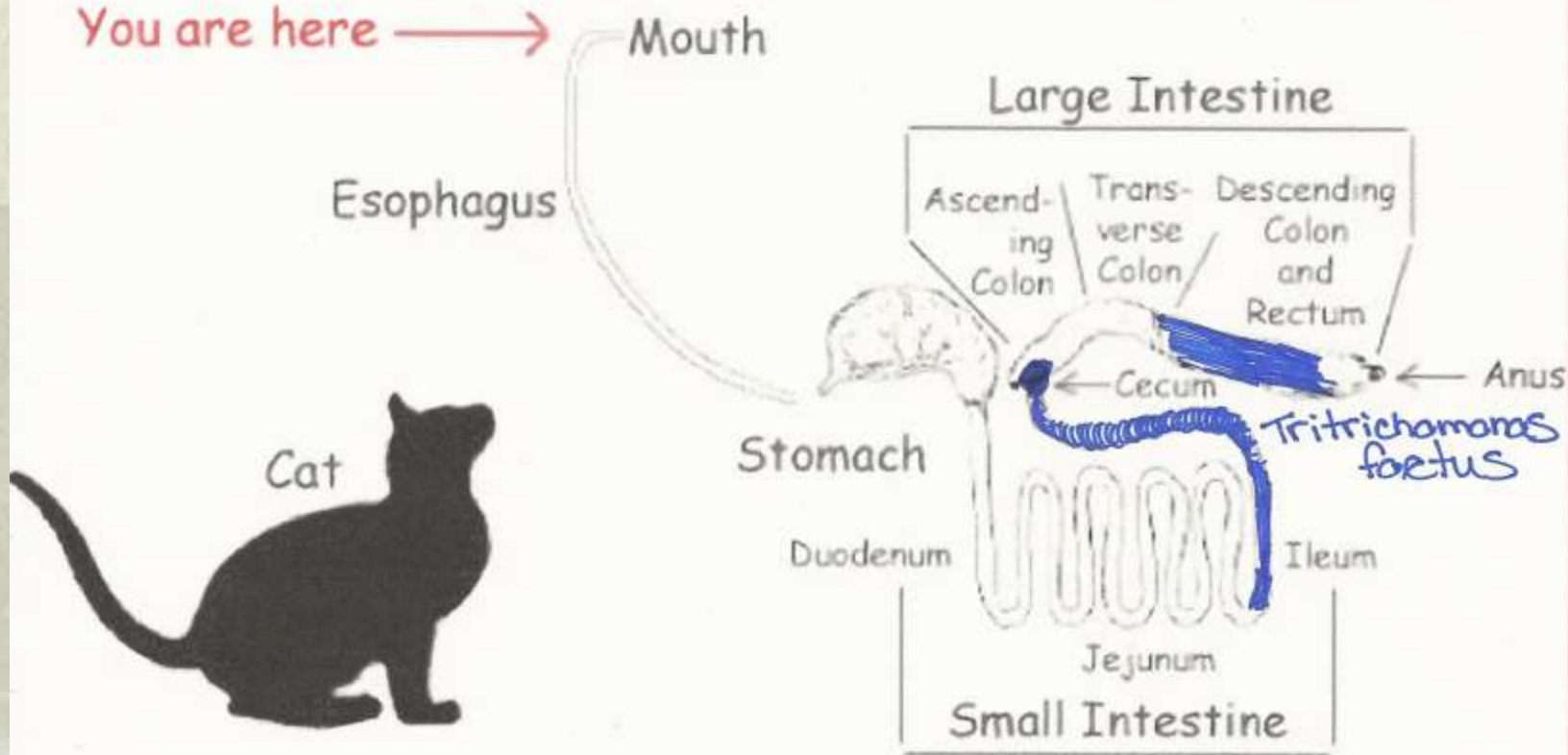
- ❖ Bathe and/or shave long haired cats
- ❖ Cleaning all litter boxes daily with bleach solution
- ❖ Isolate positive cats
- ❖ Replace and disinfect food and water dishes daily
- ❖ If can not find out the source of infection, have your water tested
- ❖ **HUMANS** are at risk of getting Giardia



Re-infection is major cause of persistent or recurring infection

Cat's Digestive Tract

You are here →



Tritrichomonas foetus

- ❖ Chronic Diarrhea
- ❖ May have Asymptomatic Carriers
- ❖ Straining
- ❖ Mucoïd diarrhea, bright red blood in stool
- ❖ Kittens usually stay healthy and active
- ❖ Maintain weight and keep good condition
- ❖ Kittens may develop very red skin around the rectum from the frequent trips to the litterbox
- ❖ Some of these kittens will have fecal incontinence
- ❖ Slugs can shed organisms on food dishes



Tritrichomonas Prevalence

- ❖ 36/117 (31%) of cats that were tested at a cat show were positive for *Tritrichomonas*
- ❖ 28/89 catteries that were represented at the show had at least one positive cat.
- ❖ Most common in kittens <1 year of age
- ❖ See in long haired breeds more frequently



Figure 3: *Tritrichomonas foetus* organism, Courtesy Dr. Heather Stockdale & Dr. Byron Blagburn

Tritrichomonas Diagnosis

- ❖ Co-infection with *Giardia* is not uncommon
- ❖ 12% of the 31% that tested positive at cat show had both organisms
- ❖ Difficult to diagnose
 - PCR with diarrheic feces to NC State is the most sensitive and specific test
 - Very Expensive
 - Takes up to 2 weeks for results
 - Feces can not have litter on them and must be fresh when collected

Treatment for Tritrichomonas

- ❖ Nothing approved in the US
- ❖ Metronidazole has been used but is not very effective
- ❖ Ronidazole is best treatment
 - Neurotoxicity can develop but is reversible once medication is discontinued
- ❖ Can have spontaneous resolution and clearance, but can take up to 2 years.
- ❖ Some resistance to antibiotics is developing

Tritrichomonas Survival

- ❖ Can survive up to 30-60 minutes in water
- ❖ 30 minutes on dry food
- ❖ 120-180 minutes on canned food
- ❖ 15 minutes on filter paper
- ❖ >180 minutes in urine
- ❖ No survival documented in cat litter
 - Must have Fresh Sample without litter for proper diagnosis

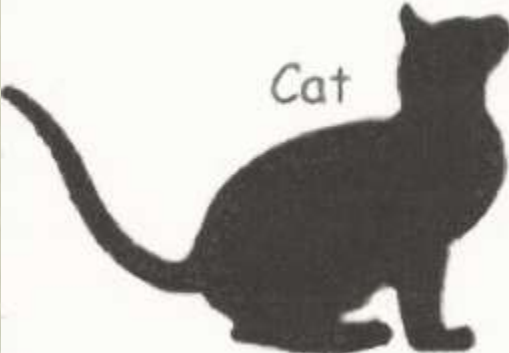


Cat's Digestive Tract

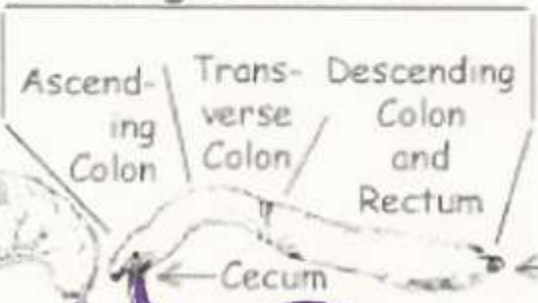
You are here →

Mouth

Esophagus



Large Intestine



Stomach

Cecum

Anus

Coccidia

Duodenum

Ileum

Jejunum

Small Intestine

Coccidia

- ❖ Anorexia, weight loss
- ❖ Severe Dehydration
- ❖ Severely Ill
- ❖ Death can occur
- ❖ Can see in up to 36% of cats
- ❖ In study performed 17.2% of owned cats in Kansas and Missouri tested positive for *Isospora*

Coccidia Treatment

- ❖ Albon oral suspension for 10 days
- ❖ Oocysts can survive for months in many environments
- ❖ Resistant to disinfectants
- ❖ Remove feces daily to help prevent reinfection



Coccidia of Dogs/Cats in NA

Dog

Cat

Unsporulated large oocysts

I. canis



I. felis

Unsporulated medium oocysts

I. ohioensis-like



I. rivolta

Unsporulated small oocysts

H. heydorni
N. caninum



H. hammondi
B. darlingi
T. gondii

Sporulated small oocysts
or sporocysts

Sarcocystis spp.



Sarcocystis spp.

Sporulated very small
oocysts without sporocysts

Cryptosporidium spp.



Cryptosporidium spp.

Cat's Digestive Tract

You are here →

Mouth

Esophagus

Large Intestine

Ascending
Colon

Trans-
verse
Colon

Descending
Colon
and
Rectum

Cecum

Anus

Stomach

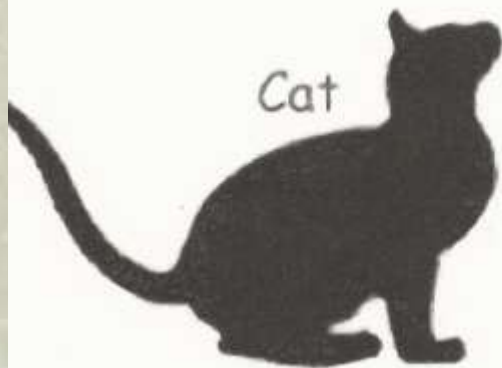
Cryptosporidium

Duodenum

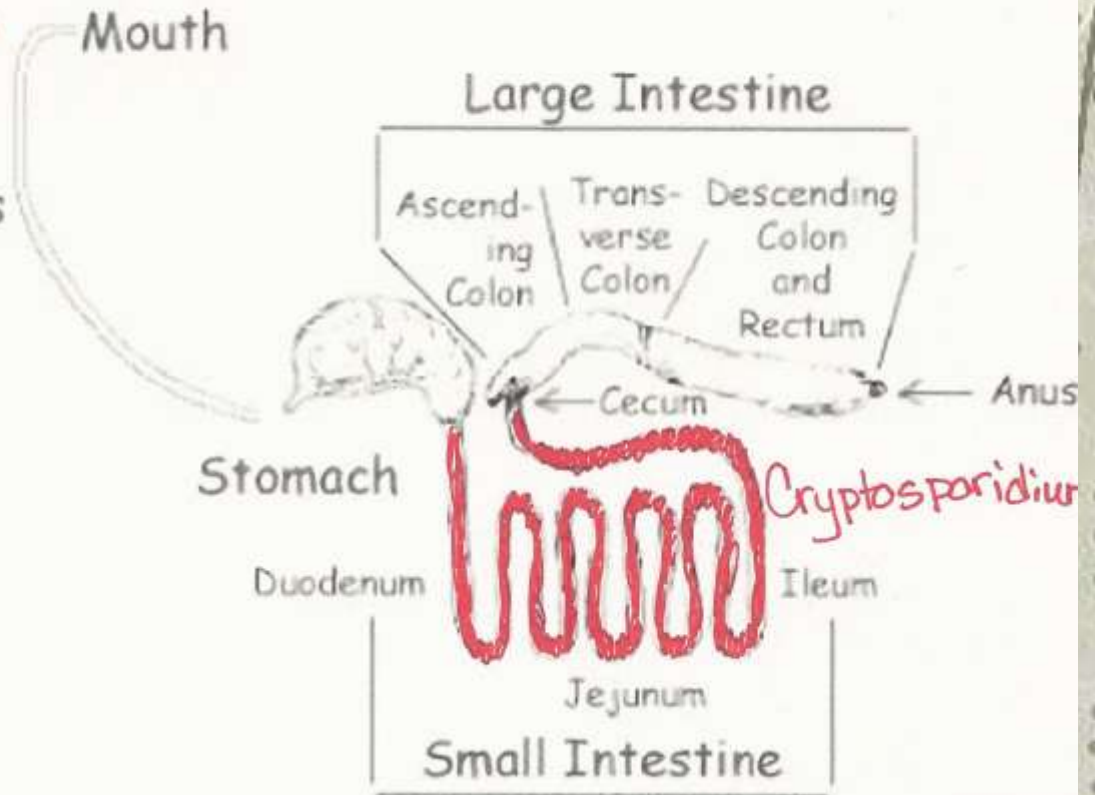
Ileum

Jejunum

Small Intestine



Cat



Cryptosporidium

- ❖ May have Asymptomatic Carriers
- ❖ Mild to severe life threatening diarrhea
- ❖ Severe Malabsorption Syndrome
- ❖ 8.3-87% of cats are positive for it
- ❖ Very difficult to diagnoses
- ❖ Intermittent Shedding
- ❖ Very Small organism and difficult to identify on fecal smears

Frustrating Treatment

- ❖ Difficult to eradicate
- ❖ Drugs are either Toxic or Ineffective
- ❖ Azithromycin as of late has been the treatment of choice
- ❖ Tylosin has been used in the past, but recent have failed to show any benefit



Cryptosporidium in the environment

- ❖ Very hardy and resistant
- ❖ Resistant to Chlorination and most disinfectants
- ❖ Difficult to filter from water and survive removal from water treatment plants
- ❖ Steam cleaning of housing and utensils may be beneficial
- ❖ Oocysts are susceptible to 5% ammonia solutions if contact time is 18 hours



Organism	Age of Onset	Clinical Signs	Prevalence	Diagnosis	Treatment	Decontaminate
Roundworms	8 weeks	Potbellied, poor hair coat vomiting/diarrhea mucoid, mild diarrhea	Up to 25%	Fecal Flotation	Pyrantel, Fenbendazole, Moxidectin	Daily removal of fecal material
Hookworms	2 weeks	Acute or chronic Anemia, +/- diarrhea, death	1.1% - New York 20% - Tennessee	Fecal Flotation - 2-4 times first year of life	Pyrantel Moxidectin, Ivermectin, Selamectin	Daily removal of fecal material
Coccidia	4 weeks	Diarrhea with weight loss, dehydration, anorexia, vomiting, depression	3-36%	Centrifugal flotation with at least 1 gr of feces	Albon	5% Ammonia disinfectant, daily removal of feces
Cryptosporidium		Mild to severe diarrhea & Dehydration Malabsorptive syndrome Can be self limiting	8.3-87%	ELISAs, and IFA on fecal Smears, very small organism hard to see on fecal	Azithromycin	Resistant to most Chlorine and Ammonia Formulations
Giardia		Acute diarrhea Pale, malodorous, +/- mucous	10.3%	Direct Smear Fecal Flotation via centrifugation ELISA*****	Metronidazole Fenbendazole	Bathe & Shampoo Ammonia Based Disinfectant Daily Cleaning
Trichostrongylus axei	0-24 months, average 9 month	Straining, Chronic Diarrhea, Increased mucous, Increased Frequency, Bright Red Blood, Irritation around anus, Active & Eating	31% cats in catteries	Culture or PCR on Fresh Diarrheic Sample Direct Smear	Ronidazole	Isolation of infected cats

Viral Causes

- ❖ Feline Panleukopenia
- ❖ Feline Enteric Coronavirus
- ❖ Feline Leukemia Virus

- ❖ Will usually have other clinical signs than just diarrhea
- ❖ No definitive treatment just supportive care

Bacterial Causes

- ❖ Bacterial overgrowth is often secondary to underlying cause
- ❖ Salmonella - prevalence only 0.8%
- ❖ Clostridium perfringens - can test positive in healthy non diarrheic kittens
- ❖ Clostridium difficile - can test positive in healthy non diarrheic kittens
- ❖ Campylobacter - can test positive in healthy kittens
- ❖ E. coli - will also test positive in healthy kittens

Reasons to Suspect Bacterial Diarrhea

- ❖ Kittens that develop diarrhea after kenneling or attending a show, after ruling out parasitic causes of diarrhea
- ❖ Kittens with an acute onset of bloody diarrhea in association with sepsis (Fever, dehydration, low WBC)
- ❖ Outbreaks of diarrhea occurring in more than one household member after parasitic causes have been ruled out
- ❖ Raw Meat Diets

Obstruction?

- ❖ Foreign Body
- ❖ Intussusception
- ❖ Developmental Abnormalities
- ❖ These problems will likely be isolated to one kitten and not a colony
- ❖ The kittens will likely be painful and not eating, and they will most likely be vomiting.
- ❖ Radiographs and surgery will likely be necessary to diagnose and correct the problem

Diet Change - Oh No!!!

- ❖ The feline intestinal tract is very sensitive to change
- ❖ There are different levels and types of fats
- ❖ Different levels and types of carbohydrates
- ❖ Different levels and types of proteins
- ❖ Changing from kitten to adult, or from one flavor to another in the same brand, from canned to dry, or dry to canned can all result in diarrhea and may require supportive treatment while they recover

Approach to Diarrhea

- ❖ Thorough History - to help rule out foreign body or nutritional cause
- ❖ FeLV/FIV
 - Immunosuppressed more likely to contract and have illness from pathogens
- ❖ Fecal Flotation via Centrifugation
- ❖ Direct Fecal Smear +/- Special Staining
- ❖ ELISA testing to rule out Giardia
- ❖ CBC & Chemistry if no answers w/fecal
- ❖ Tritrichomonas PCR

Still no Answers

- ❖ Fecal/Rectal Cytology
- ❖ Clostridium enterotoxin testing
- ❖ Cryptosporidium testing
- ❖ Fecal Culture
- ❖ Antech and IDEXX laboratories both have diarrhea panels available - expensive but may be necessary

What can we do while we wait on the testing?

- ❖ Routine Deworming - Pyrantel Pamoate (Nemex)
- ❖ Nutritional Support - Highly Digestible Protein
- ❖ Probiotics?!?!?!
 - Fortiflora ® - Purina
 - Provable ® - Nutramax
- ❖ Fluid Replacement
 - IV
 - SQ
 - Oral
- ❖ Vitamin B12 - cobalamin



Daily water requirement

- ❖ In a healthy cat 30 mLs (1 ounce) of water per pound body weight is required per day.
- ❖ This requirement can double and triple when cats have diarrhea
- ❖ Getting a cat to consume this amount of water can be very difficult
- ❖ Canned food can provide a large quantity of that water needed along with injectable fluids to replenish the fluid losses

Fluids, Fluids, Fluids!!!!!!

- ❖ Enough can not be said on the importance of maintaining hydration.
- ❖ IV, SQ, or oral replacement
- ❖ IV - Clinically dehydrated and ill
 - Weight loss, skin tent, sunken eyes, weak, sticky gums
- ❖ SQ - mildly dehydrated with minimal continued diarrhea
 - Mild skin tent, sticky gums, still eating and drinking
- ❖ Oral - no dehydration



What goes IN?

- ❖ Highly Digestible
- ❖ Relatively Large Amounts of Fermentable Fiber
- ❖ Some Available Commercial Diets
 - Purina EN
 - Hill's Prescription Diets: i/d low fat, i/d, w/d, z/d
 - Iams: Low Residue
 - Royal Canin: Gastrointestinal HF
- ❖ If no response to initial commercial diet within 1-2 weeks, it is worthwhile to try different commercial diet due difference in make up of food
- ❖ If no response to commercial diets, may try **COOKED** Chicken or Turkey Diet for 5-10 days without Carbohydrates
- ❖ Do not feed longer than 10 days to kittens



Protein Digestibility

- ❖ Meat Source more digestible than Plant Source
- ❖ Animal Proteins more digestible than Meat By-Products
- ❖ Meat Meals are a good source of protein

Carbohydrates

- ❖ Decrease the number and amounts of Carbohydrates
- ❖ Cats use protein for energy and do not require carbohydrates
- ❖ A single source of carbohydrates is better than multiple sources
- ❖ Highly digestible carbohydrate sources better than complex plant sources
- ❖ Canned Food Diets contain less carbohydrates and may be better to use in the cases of feline diarrhea

Probiotics

- ❖ Probiotics
 - Live microorganism which when administered in adequate amounts confer a health benefit to the host
- ❖ Not FDA regulated
- ❖ Provable® - Nutramax
- ❖ Fortiflora® - Purina
- ❖ Others are available but these have some of the best quality control



Support for Probiotics

- ❖ Kittens fed a probiotic at 6 weeks of age had better immune response at 27 weeks of age than those that were not given the probiotic
- ❖ A double blind study of dogs with acute diarrhea were treated with probiotic and recovered statistically sooner than dogs without
- ❖ Cats with chronic herpes virus showed less morbidity when given probiotic, but more study is necessary
- ❖ In canine trial on acute diarrhea, dogs treated with a probiotic were less likely to require Metronidazole, and the diarrhea resolved sooner in dogs that received probiotic vs dogs that received no treatment

Ingredient Comparisons

❖ Fortiflora®

- ❖ Purina
- ❖ Animal digest, *Enterococcus faecium*, L-ascorbyl- 2-polyphosphate (source of Vitamin C), Vitamin E supplement, beta-Carotene, zinc proteinate, taurine, salt, manganese proteinate, ferrous sulfate, copper proteinate, calcium iodate, sodium selenite. C-4583

❖ Proviable®

- ❖ Nutramax Laboratories
- ❖ **Guaranteed Analysis Paste:** Total Bacteria, min 0.5 billion CFUs* per gram
*Colony forming units. (*Enterococcus faecium*, *Streptococcus thermophilus*, *Lactobacillus acidophilus*, *Lactobacillus bulgaricus*, *Lactobacillus casei*, *Bifidobacterium bifidum*, and *Lactobacillus plantarum*)
- ❖ **Ingredients Paste:** Soybean Oil, **Kaolin**, Dried *Bifidobacterium bifidum* Fermentation Product, **Pectin**, Yeast Extract, Fructooligosaccharide, Gum Arabic, Dried *Enterococcus faecium* Fermentation Product, Dried *Streptococcus thermophilus* Fermentation Product, Dried *Lactobacillus bulgaricus* Fermentation Product, Dried *Lactobacillus acidophilus* Fermentation Product, Dried *Lactobacillus casei* Fermentation Product, Artificial Beef Flavor, and Dried *Lactobacillus plantarum* Fermentation Product.
- ❖ **Guaranteed Analysis Capsule:** Total Bacteria, min 5 billion CFUs* per capsule
*Colony forming units. (*Enterococcus faecium*, *Streptococcus thermophilus*, *Lactobacillus acidophilus*, *Lactobacillus bulgaricus*, *Lactobacillus casei*, *Bifidobacterium bifidum*, and *Lactobacillus plantarum*)
- ❖ **Ingredients Capsule:** Dried *Bifidobacterium bifidum* Fermentation Product, Gelatin, Yeast Extract, fructooligosaccharide, Gum Arabic, Dried *Enterococcus faecium* Fermentation Product, Dried *Streptococcus thermophilus* fermentation Product, Dried *Lactobacillus bulgaricus* Fermentation Product, Dried *Lactobacillus acidophilus* Fermentation Product, Dried *Lactobacillus casei* Fermentation Product, Dried *Lactobacillus plantarum* Fermentation Product, and Titanium Dioxide.

Vitamin B12

- ❖ Cobalamin
- ❖ Arises from bacterial synthesis
- ❖ Sources are from muscles proteins and organ tissues
- ❖ Important for gastrointestinal health



Vitamin B12

- ❖ Requires a healthy stomach and pancreas to turn into active form for absorption
- ❖ Absorbed in the ileum
- ❖ Chronic intestinal disease results in decreased absorption and requires injectable form to replenish Cobalamin



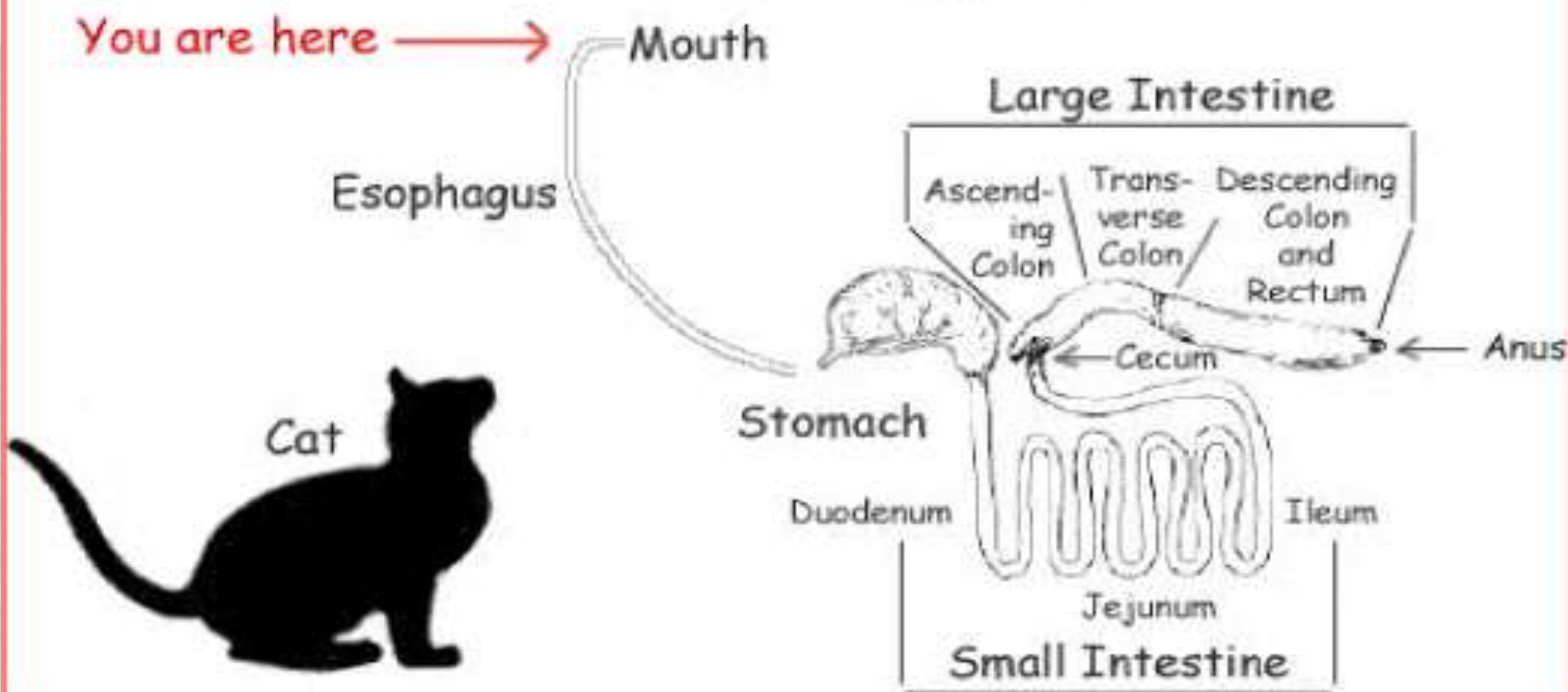
In Summary

- ❖ Common causes of kitten diarrhea are infectious and dietary changes
- ❖ Have fecal performed including Giardia ELISA
- ❖ Give them both nutritional support as well as empirical therapy while waiting on test results
- ❖ Removal of feces multiple times per day
- ❖ Isolate kittens and cats with diarrhea from the rest of the cattery
- ❖ Remember even if the fecal is negative, routine deworming should still be performed

Questions?



Cat's Digestive Tract



Organism	Age of Onset	Clinical Signs	Prevalence	Diagnosis	Treatment	Decontaminate
Roundworms	8 weeks	Potbellied, poor hair coat vomiting/diarrhea mucoid, mild diarrhea	Up to 25%	Fecal Flotation	Pyrantel, Fenbendazole, Moxidectin	Daily removal of fecal material
Hookworms	2 weeks	Acute or chronic Anemia, +/- diarrhea, death	1.1% - New York 20% - Tennessee	Fecal Flotation - 2-4 times first year of life	Pyrantel Moxidectin, Ivermectin, Selamectin	Daily removal of fecal material
Coccidia	4 weeks	Diarrhea with weight loss, dehydration, anorexia, vomiting, depression	3-36%	Centrifugal flotation with at least 1 gr of feces	Albon	5% Ammonia disinfectant, daily removal of feces
Cryptosporidium		Mild to severe diarrhea & Dehydration Malabsorptive syndrome Can be self limiting	8.3-87%	ELISAs, and IFA on fecal Smears, very small organism hard to see on fecal	Azithromycin	Resistant to most Chlorine and Ammonia Formulations
Giardia		Acute diarrhea Pale, malodorous, +/- mucous	10.3%	Direct Smear Fecal Flotation via centrifugation ELISA*****	Metronidazole Fenbendazole	Bathe & Shampoo Ammonia Based Disinfectant Daily Cleaning
Trichostrongylus axei	0-24 months, average 9 month	Straining, Chronic Diarrhea, Increased mucous, Increased Frequency, Bright Red Blood, Irritation around anus, Active & Eating	31% cats in catteries	Culture or PCR on Fresh Diarrheic Sample Direct Smear	Ronidazole	Isolation of infected cats

Coccidia of Dogs/Cats in NA

Dog

Cat

Unsporulated large oocysts

I. canis



I. felis

Unsporulated medium oocysts

I. ohioensis-like



I. rivolta

Unsporulated small oocysts

H. heydorni
N. caninum



H. hammondi
B. darlingi
T. gondii

Sporulated small oocysts
or sporocysts

Sarcocystis spp.



Sarcocystis spp.

Sporulated very small
oocysts without sporocysts

Cryptosporidium spp.



Cryptosporidium spp.

QuickTime™ and a
decompressor
are needed to see this picture.



References

- ❖ Craven, M. Management of Kitten Diarrhea. *NAVC Clinicians Brief*. pp 59-63, August 2010.
- ❖ Gookin JL, Stebbins ME, Hunt E, et al. Prevalence of and risk factors for feline *Tritrichomonas foetus* and *Giardia* infection. *Journal of Clinical Microbiology*. 42: 2707-10, 2004.
- ❖ Herstad HK, Nesheim BB, L'Abée-Lund T, et al. Effects of a probiotic intervention in acute canine gastroenteritis - a controlled clinical trial. *Journal of Small Animal Practice*. 51(1): 34-38, 2010.
- ❖ Laflamme DS, Long GM. Evaluation of two diets in the nutritional management of cats with naturally occurring chronic diarrhea. *Veterinary Therapeutics*. 5: 43-51, 2004.
- ❖ Lappin MR, et al. Pilot Study to evaluate the effect of oral supplementation of *Enterococcus faecium* SF68 on cats with latent feline herpesvirus 1. *Journal of Feline Medicine & Surgery*. 11(8): 650-654, 2009.
- ❖ Little, Susan. Diarrhea in Kittens and Young Cats. *World Small Animal Veterinary Association World Congress Proceedings, 2011*.
- ❖ Marks, SL, Willard MD. Diarrhea in kittens. In, August, JR (ed). *Consultations in Feline Internal Medicine, vol 5*. Elsevier, St. Louis, MO., pp133, 2006.
- ❖ McReynolds Ca, Lappan MR, Ungar B, et al. Regional seroprevalence of *Cryptosporidium parvum* specific IgG of cats in the United States. *Veterinary Parasitology*. 80: 187-90, 1999.
- ❖ Peterson, ME. The Digestive System. Peterson, ME, Kutzler, MA. *Small Animal Pediatrics: The First 12 Months of Life*. Elsevier, St. Louis, MO., pp 359, 2011.
- ❖ Ruaux C, Steiner JM, Williams DA. Early Biochemical and clinical responses to cobalamin supplementation in cats with signs of gastrointestinal disease and severe hypocobalaminemia. *Journal of Veterinary Internal Medicine*. 19: 155-60, 2005.
- ❖ Veir JK, et al. Effect of supplementation with *Enterococcus faecium* (SF68) on immune function in cats. *Veterinary Therapeutics*. 8(4): 229-238, 2007.
- ❖ Zoran, DL. The cat with signs of acute small bowel diarrhea. *Rand, J. Problem-Based Feline Medicine*. Elsevier, St. Louis, MO., pp 697, 2006.

References

- ❖ www.capcvet.org
- ❖ Prevalence and factors associated with fecal shedding of *Giardia* spp. in domestic cats. Vasilopoulos RJ, Mackin AJ, Rickard LG, et al. JAAHA 42:424-429, 2006.
- ❖ Comparison of 4 *Giardia* diagnostic tests in diagnosis of naturally acquired canine chronic subclinical giardiasis. Rishniw M, Liotta J, Bellosa M, et al. J Vet Intern Med 24:293-297, 2010.
- ❖ Prevalence of and risk factors for feline *Tritrichomonas foetus* and *Giardia* infection. Gookin JL, Stebbins ME, Hunt E, et al. J Clin Microbiol 42:2707-2710, 2004.
- ❖ Efficacy of ronidazole for treatment of feline *Tritrichomonas foetus* infection. Gookin JL, Copple CN, Papich MG, et al. J Vet Intern Med 20:536-543, 2006.
- ❖ Determination of the in vitro susceptibility of feline *Tritrichomonas foetus* to 5 antimicrobial agents. Kather EJ, Marks SL, Kass PH. J Vet Intern Med 21:966-970, 2007.
- ❖ Safety, pharmacokinetics and use of the novel NK-1 receptor antagonist maropitant (Cerenia) for the prevention of emesis and motion sickness in cats. Hickman MA, Cox SR, Mahabir S, et al. J Vet Pharmacol Ther 31:220-229, 2008.
- ❖ A critical assessment of antimicrobial treatment in uncomplicated *Salmonella* enteritis. van Duijkeren E, Houwers DJ. Vet Microbiol 73:61-73, 2000.