Prevalence of Bacterial, Viral, and Parasitic Enteropathogens in 300 Dogs Frequenting Dog Parks

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Background

- The human-animal bond augments human physical and psychological health
  - Dog parks are a socially interactive environment for dogs and dog owners
- Dogs attending dog parks represent a different population than those in veterinary settings
- Contact with other dogs, humans, and environmental features facilitates the transmission of enteropathogens
  - Dog-dog, dog-human, and human-dog transmission
  - Recently, there has been an alarming increase in the prevalence of parasitic enteropathogens in dogs, particularly hookworms
  - Many enteropathogens that infect dogs are zoonotic, including Giardia, Salmonella, and *Campylobacter jejuni*

Hypotheses & Aims

Hypotheses

- Apparently healthy dogs will be frequently infected with a variety of bacterial, viral, and parasitic enteropathogens
- There will be no correlation between infection with one or more enteropathogens and stool consistency
- Zoonotic enteropathogens will be detected in a subset of apparently healthy, non-diarrheic dogs

Specific Aims

1. Determine the prevalence of bacterial, viral, and parasitic enteropathogens in 300 privately-owned dogs frequenting 3 dog parks in Northern CA
2. Investigate risk factors associated with infection with enteropathogens and shedding
3. Determine the prevalence of multidrug resistant hookworms and zoonotic Giardia

Methods

- A flag identification system was used to detect the stool and assign each dog a unique ID
- Owners were issued a questionnaire to assess risk factors
- Owners were offered an at-home follow-up collection kit to sample their dog's stool one month following the original collection for comparison
- Veterinary students and dog owners scored the dog's stool using a modified Purina Fecal Scoring Scale (1-6), where scores of 4-6 represented diarrheic specimens

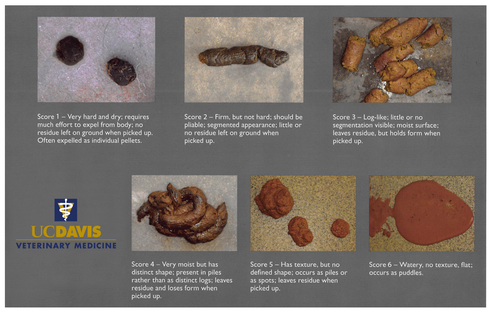


Figure 1: *Modified Purina Fecal Scoring Chart*

Methods (cont.)

Each stool specimen underwent extensive conventional and molecular diagnostic testing:

1. Zinc sulfate double centrifugation flotation
2. Giardia ELISA
3. KeyScreen PCR – a novel PCR panel capable of identifying 20 GI parasites, including multidrug resistant hookworms and zoonotic Giardia

Results

Age

	Davis	Natomas	Woodland
Range (years)	0.5-13	0.25-16	0.5-17
Median (years)	3	2	3.25

Table 1: *Age representation for 300 dogs at 3 different dog parks*

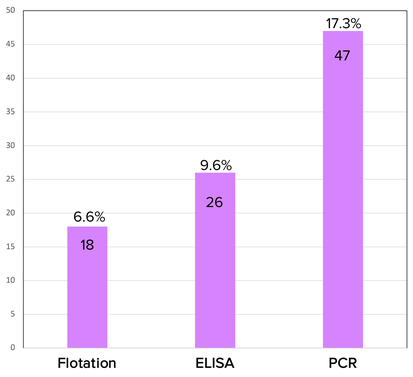


Figure 2: *Comparison of 3 testing methods for the diagnosis of Giardia from 272 dogs*

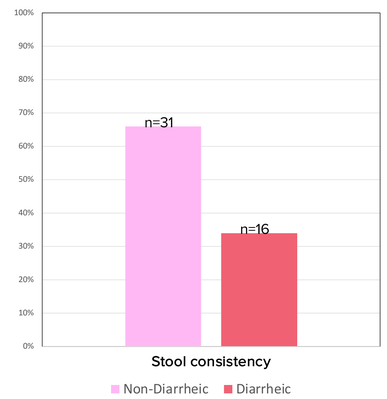
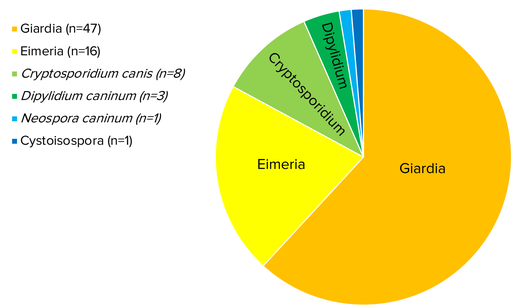


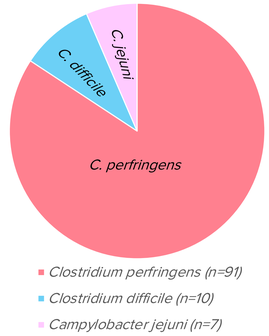
Figure 3: *Stool consistency of dogs with Giardia infection (n=47 dogs) from 272 dogs*



Co-infections with ≥2 parasites was observed as follows:
Giardia + Eimeria (n=4)
Giardia + Dipylidium (n=2)
Giardia + Cryptosporidium + Dipylidium (n=1)
Giardia + Cryptosporidium (n=1)
Eimeria + Dipylidium (n=1)
Eimeria + Cryptosporidium (n=1)

Figure 4: *Overview of parasitic enteropathogens identified in 70 of 272 dogs*

Results (cont.)



Clostridium perfringens Toxin Genes Detected in 91 dogs	Number of Dogs
C. perfringens α toxin gene alone	44
C. perfringens enterotoxin gene alone	7
C. perfringens NetF toxin gene alone	4
C. perfringens α toxin gene & enterotoxin gene	35
C. perfringens α toxin gene, enterotoxin gene, & NetF toxin gene	1

Table 2 (above): *C. perfringens toxin genes detected in 91 of 272 dogs*

Figure 5 (left): *Bacterial enteropathogens detected in 108 of 272 dogs. No dogs were infected with Salmonella spp.*

Viral Organism	Number of Dogs
Canine Circovirus	6
Canine Enteric Coronavirus	2
Canine Distemper Virus	1

Table 3: *Viral enteropathogens detected in 9 of 272 dogs. No dogs were infected with Canine Parvovirus Type-2 or Canine Rotavirus*

Discussion

- All Giardia assemblages from identified infections were non-zoonotic
  - Assemblages C and D
- No hookworms were identified on flotation or PCR, which is a similar result in comparison to a 2016 dog park study[1]
- There was no apparent correlation between fecal score and infection with ≥1 enteropathogens
  - Many socially active dogs are infected yet asymptomatic with normal stools
- There was a high association between ingestion of raw food or supplements and infection with *Campylobacter jejuni*
  - 5/7 of these dogs had non-diarrheic stool specimens

Future Considerations

- A comprehensive analysis of risk factors is being conducted
- At-home collection kits collected one-month post-dog park visit will shed further light on the presence of Giardia and *Cryptosporidium canis* in asymptomatic dogs that tested positive earlier at dog parks

Acknowledgements

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References

1. Hascall KL, Kass PH, Saksen J, et al. Prevalence of enteropathogens in dogs attending 3 regional dog parks in Northern California. J Vet Intern Med. 2016; 30(6): 1838-45.