

# **Treating Drug Resistant Hookworms**

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# Hookworms and Greyhounds

- Major recent health concern in racing greyhound population
- Rise in prevalence last 3-4 years
- First recognized in adoption community
- Almost all recently retired racers affected
- Long term treatment often required
- **All foster homes and adopters need to be properly educated!**



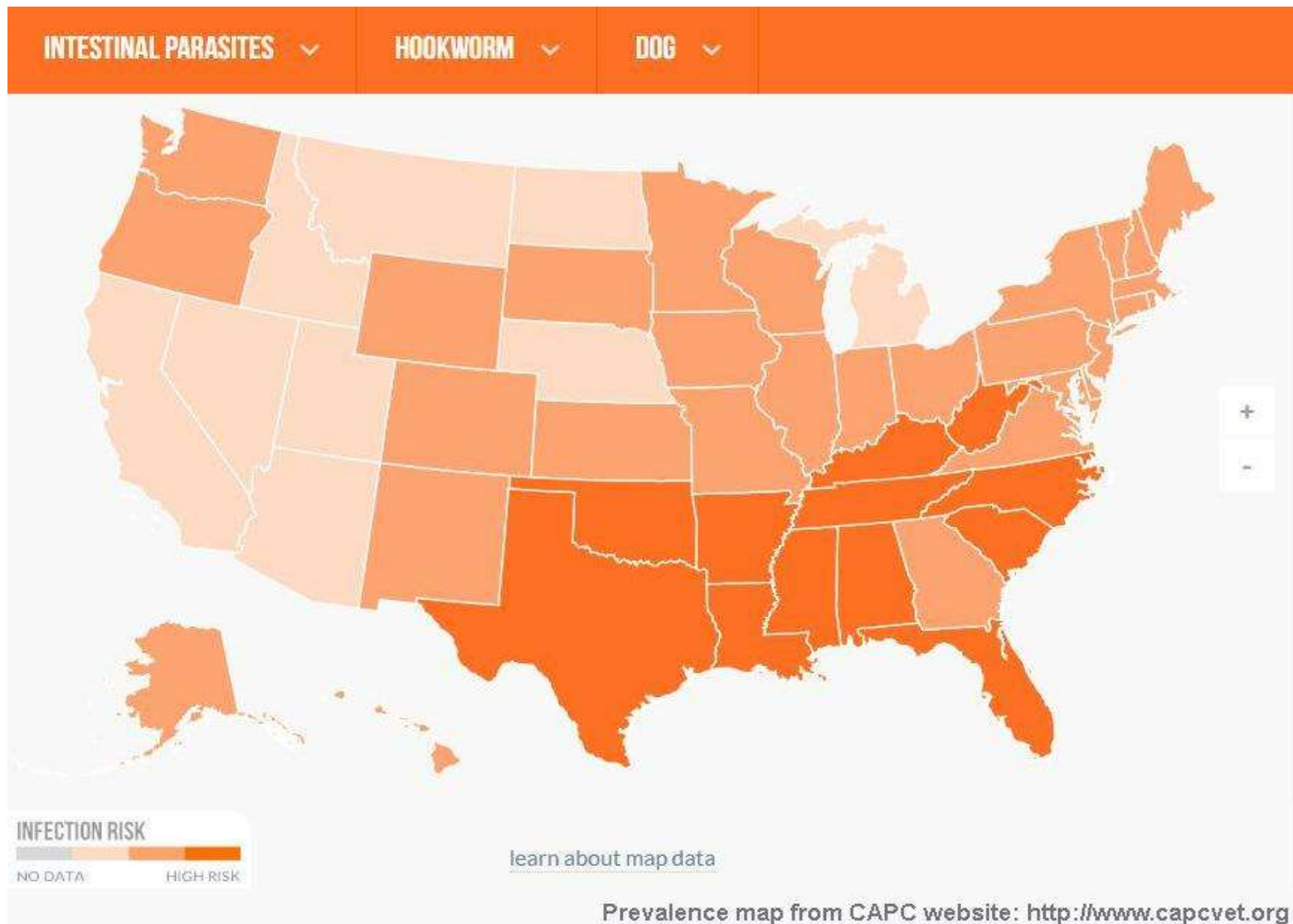
# Meet the Hookworm

- Parasite that lives in the small intestines
- Attach to intestinal lining and feed on blood
- Adult worms 10-20 mm in length (0.5-0.75 inch)

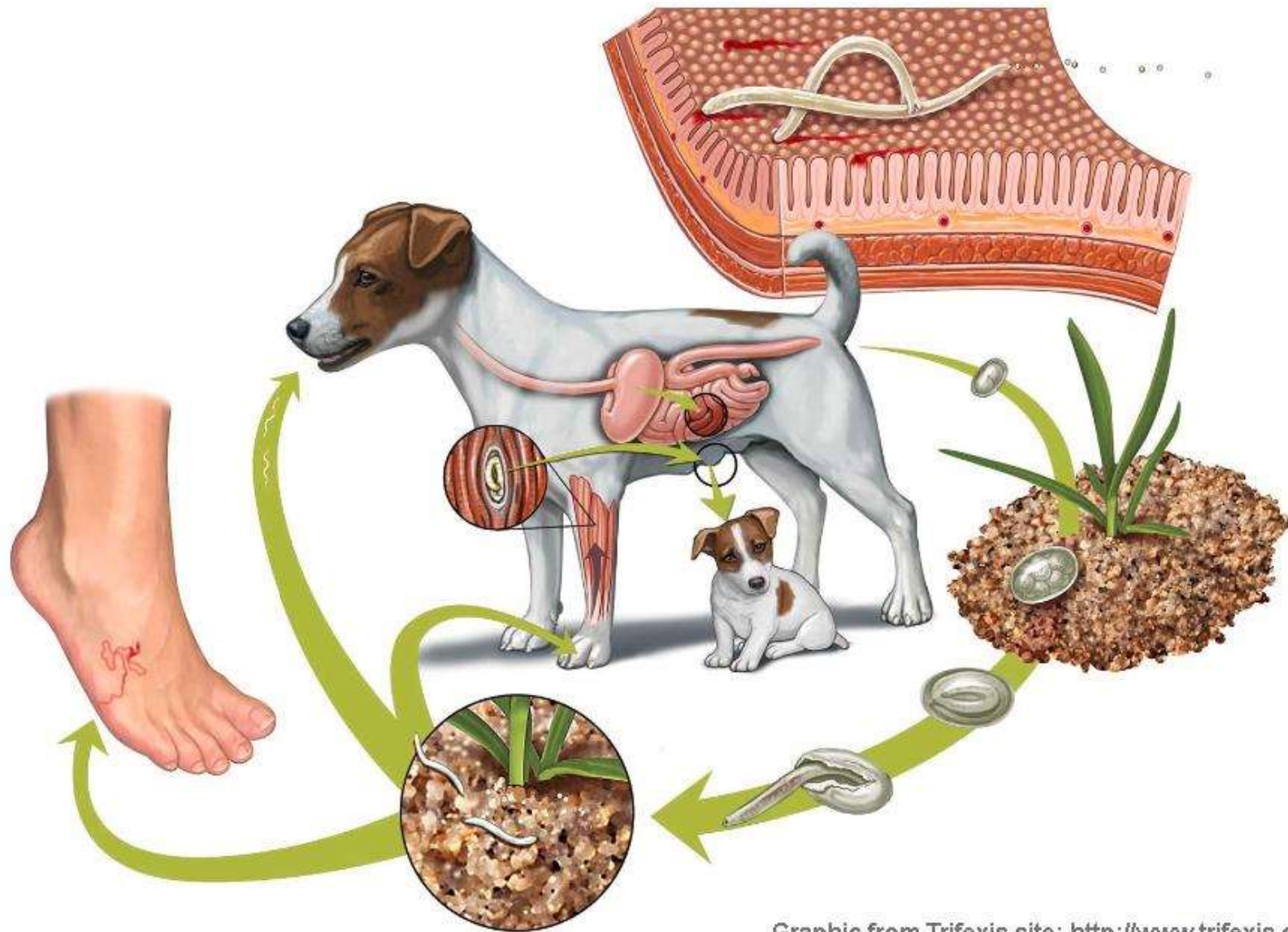


# Where Are Hookworms Found?

- Throughout the U.S. - more common in warm, moist climates



# Life Cycle



Graphic from Trifexis site: <http://www.trifexis.com>

# Why Greyhounds?

- Unique high density population
- Environment ideal for worms
- Aggressive deworming protocols select for resistant worms over time
- Larval leak phenomenon
- Delayed recognition due to lack of clinical signs in familiar environment and no routine testing
- Farms and racing kennels changing protocols but limited deworming options



# Persistent Hookworms

- Larval Leak
  - Immature larvae dormant in tissues
  - Reinfect intestines when dewormed
  - Immune component?
  - Overwhelming burden?
- Resistance
  - Proven in recent UGA study (other breeds too)
  - All approved deworming products



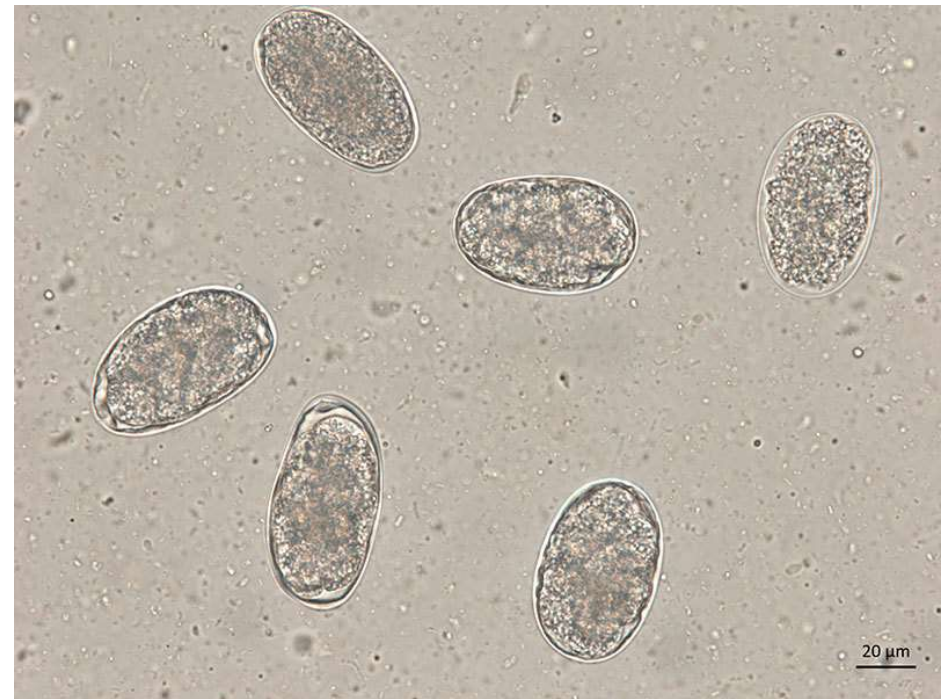
# Symptoms

- **Many asymptomatic**
- Signs triggered by stress
  - Transport
  - Change in surroundings
  - Surgery
- Loose stools
- Bloody diarrhea
- Poor appetite
- Grumbly stomach and gas
- Signs often intermittent, cyclic



# Diagnosis

- Fecal flotation
  - Passive/tabletop
  - Centrifugation
  - Detects eggs
  - Present >2-3 weeks after infection
- IDEXX fecal antigen
  - Tests for antigen from immature and mature worms in intestines
  - Detectable >9 days after infection



# Treatment – Deworming Products

Pyrantel pamoate

Strongid-T, Drontal Plus

Fenbendazole/Febantel

Panacur, Safeguard, Drontal Plus

Milbemycin oxime

Interceptor, Sentinel, Trifexis

Moxidectin

Advantage Multi, Coraxis, ProHeart, Quest

Ivermectin (high dose)

No approved products

# Treatment – Persistent Cases

**\*\* Consider all recently retired racers to have persistent hookworms. \*\***

- Larval Leak
  - Deworm every 2 weeks to break life cycle  
(Exception: Advantage Multi/Coraxis – steady state)
  - Need to maintain treatment long term
  - Treat consistently until at least 3 negative fecal tests
- Suspected resistance
  - Combine/alternate products
  - Longer duration of treatment (ie. 5-7 days Panacur)
  - Higher dose? (increased risk of side effects)

# Treatment – Persistent Cases

- Topical moxidectin (Advantage Multi, Coraxis) mainstay of treatment
  - Administer monthly (every 2 weeks?)
  - Steady state after 3 doses providing continual deworming
- Middle-of-month deworming
  - Especially 1<sup>st</sup> two months of Advantage Multi/Coraxis
  - If symptomatic vs long term
  - Drontal Plus (or generic/compounded)
  - 5-7 day course of Panacur + pyrantel on last day



# Treatment – Persistent Cases

## “Triple Combination”

- moxidectin
- pyrantel
- fenbendazole



# Alternate Treatment Protocols?

## Emodepside (Profender)?

- Approved for dogs in Europe
- Only available for cats in US
- Off-label/experimental
- Good results - small number of cases
- Reserve for clinical cases with evidence of resistance
- Have your vet contact Dr. Pablo Jimenez Castro at UGA for details



# Follow Up Testing – Fecal Float

- Timing relative to deworming important!
- Standard fecal flotation – egg detection
  - Semi-quantitative but dependent on sample/size
  - May be false negative within 7-10 days of deworming due to suppression of egg production
  - Positive 14 days after deworming likely due to some degree of resistance
  - Positive >14-21 days may be due to larval leak

# Follow Up Testing – Fecal Float

- Fecal egg count (McMasters, Mini-FLOTAC)
  - Modified flotation test allowing quantitative assessment of eggs
  - Useful for assessing degree of resistance - compare eggs counts before and after treatment



# Follow Up Testing - Antigen



- IDEXX fecal antigen test
  - Ideal window to assess efficacy of treatment: 8-11 days post-deworming
  - Positive result >12 days after deworming possibly due to larval leak
  - Persistent positive antigen with negative fecal float for eggs indicates killing immature worms before eggs produced (or suppression of egg production)

# Symptoms

- **Majority show no signs**
- Most common symptoms
  - Diarrhea/blood in stool
  - Vomiting/poor appetite
- Intermittent/cyclic signs due to worm life cycle
- Some show symptoms after deworming
  - Usually not drug reaction
  - High worm burden – antigenic response



# Symptomatic Treatment

- Diarrhea
  - Metronidazole
  - Probiotic
  - Fiber
  - Diet
- Vomiting/Poor appetite
  - Bland diet
  - Antacid
- Severe signs
  - Hospitalization
  - IV fluids/medication



# Importance of Treatment

- All retired racers should be screened for worms, even if asymptomatic; retest a few weeks later if negative on arrival
- Potential for illness
- Contamination of environment and transmission to other dogs
- Zoonotic risk – cutaneous and visceral larval migrans



# Minimizing Risk

- Dogs
  - Pick up stool asap
  - Routine fecal testing for all dogs in home
  - Monthly HW preventative that covers hookworms
- Humans
  - Wash hands
  - Gloves when gardening
  - Do not go barefoot in yard
  - No effective environmental treatment



# Resources

Handout: “Hookworms and Racing Greyhounds”  
(on back) Document by Dr. Michael Dryden, Kansas State

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# Questions?

