Baylisascaris procyonis prevalence and dynamics in a rodent population in Georgia

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Background
Zoonotic pathogens pose a significant public health risk and to understand risks of infection, their prevalence and distribution are needed. In addition, understanding the factors that modify zoonotic pathogen prevalence among wild populations or transmission to people can help prevent human infections. Baylisascaris procyonis, the intestinal raccoon roundworm, is a significant pathogen of many avian and mammalian species, including humans. The parasite can cause visceral larval migrans that can result in ocular or neural larva migrans (NLM) if larvae migrate through the eye or central nervous system, respectively. Previous work on B. procyonis in Indiana showed that increased habitat fragmentation increased the prevalence of infections among Peromyscus leucopus (Kellner et al. 2012). Although B. procyonis is widespread in raccoons in US, there are regional differences in prevalence with higher rates being found in the upper Midwest, Northeast, and Western states. Thus, raccoon infection rates in Indiana are much higher than in Georgia, where B. procyonis is emerging (Kellner et al. 2012, Blitzard et al. 2010). Because of the recent recognition and low prevalence of B. procyonis in Georgia, it is currently unknown if transmission is occurring among rodents or if it is restricted to raccoons. Additionally, relatively few studies have documented B. procyonis infections in rodents and none of these studies have been conducted outside of Indiana.

Objectives and Hypotheses
1. Determine the prevalence of B. procyonis in rodents to better understand the ecology of this parasite in Georgia. We hypothesize that multiple rodent species will be infected and that prevalence rates will be lower than those reported from Indiana where the prevalence in raccoons is higher than in Georgia.
2. Determine if disturbance impacts B. procyonis infection rates. We hypothesize that increased disturbance will increase the prevalence of the parasite.

Methods
Rodents were trapped with Sherman traps baited with oatmeal and bird seed at five sites chosen to represent low and high disturbance habitats in Clarke, Oconee, and Jackson Counties in Georgia. Disturbance intensity was designated based on observed forest fragmentation. Specimens were preserved in 10% formalin and species identification was performed using the Georgia Museum of Natural History database. Rodents were euthanized with an intraperitoneal injection of sodium pentobarbital (MTC Laboratories, Memphis, TN) and exsanguinated via heart puncture. Species, weight, and measurements were determined and recorded. Bodies were blended and digested with 0.3% pepsin/1% HCl at 37°C for microscopic identification of larval B. procyonis (Page et al. 2008). Gastrintestinal tracts were opened, washed, and added into a blender with remainder of tissues from each skinned rodent. Contents were microscopically analyzed for B. procyonis.

Results
Rodents from two sites in Jackson and Clarke counties of Georgia were positive for B. procyonis (Table 1). Infections were only noted in Peromyscus leucopus which had a range of 1-12 larvae in their bodies and only one had one larva in the brain (Table 2). No significant difference was noted between prevalence rates in rodents from high or low disturbance sites (p=.100). Additionally, no significant differences (p=.588) existed between species of rodents.

Conclusions
1. B. procyonis has only been recently reported in raccoons from Georgia and our study confirmed that infections are present in wild, clinically-normal P. leucopus. This is the first report of infected wild, clinically-normal rodents outside of Indiana.
2. Only P. leucopus were infected; however, low sample sizes for other rodent species limits the significance.
3. We documented B. procyonis in Jackson County for the first time.
4. No difference in prevalence between high and low levels of disturbance was observed, but additional study of this is warranted.
5. Because this parasite causes disease in numerous avian and mammalian hosts, wildlife with neurologic disease should be considered suspect for B. procyonis infection.

Discussion
Our study confirmed that rodents in Georgia are infected with B. procyonis, even though the prevalence of B. procyonis in raccoons is low (10-12%, Eberhard et al., 2003; Blitzard et al., 2010). The lower infection rate among rodents compared with previous studies in similar habitats in Indiana was expected because of the difference in prevalence among raccoons in Indiana compared with Georgia (Kellner et al., 2012; Beasley et al., 2013). However, rodents infected which confirms that the parasite is not being maintained by raccoons alone and provides additional data on the role of wild, clinically- normal rodents as intermediate hosts of this parasite.

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Acknowledgements
We thank the Population Biology of Infectious Diseases REU Site at the University of Georgia for their support. Additional support was provided by SCWDS through sponsorship of member states. We also wish to thank Chris Cleveland, Sonia Vial, and various SCWDS veterinary externs for field and laboratory assistance.

Literature Cited