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Concurrent Seroprevalence of Antibodies to *Toxoplasma gondii* and *Toxocara* Species in the United States, 2011–2014

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To the Editor—

We report supplemental findings incorporating *Toxoplasma gondii* serology results from our study of risk factors for *Toxocara* seropositivity in the United States [1] using stored serum samples collected from the National Health and Nutrition Examination Survey (NHANES), 2011–2014. Whereas *T. gondii* is a protozoan parasite and *Toxocara* is an intestinal nematode, both share ingestion of contaminated soil as means of exposure in humans. Both parasites can contaminate soil when environmentally resistant *T. gondii* oocysts or *Toxocara cati* eggs are shed in the feces of infected cats [2, 3].

Of the 13 509 persons in our study who had samples available for testing for *Toxocara* antibody, 13 507 and 13 194, respectively, underwent *T. gondii* immunoglobulin (Ig) G and IgM enzyme immunoassay testing (Bio-Rad). Women pregnant at the time samples were collected or 1 year previously were excluded from IgM testing. The age-standardized weighted estimate of *T. gondii* IgG seroprevalence was 10.4% (95% confidence interval [CI], 9.2%–11.8%) [4], lower than the previously reported age-standardized seroprevalence of 12.4% from NHANES 2009–2010 [5]. Of the 1635 individuals who were *T. gondii* IgG positive and also underwent IgM testing, an age-standardized weighted estimate of 92.9% (95% CI, 90.2%–95.0%) were *T. gondii* IgM seronegative, suggesting that they had been infected for ≥6 months at the time their blood sample was collected.

We note that *T. gondii* IgG seropositivity is a risk factor (odds ratio, 2.2; 95% CI, 1.7–2.9) for *Toxocara* seropositivity when incorporated into the multiple logistic regression model from our previous report (Table 1). The following are again risk factors for *Toxocara* seropositivity: age ≥70 years (vs 6–11 years), non-Hispanic black race/Hispanic origin (vs

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non-Hispanic white), male sex, living below the poverty level, households with ≥0.5 persons per room, educational level less than college, and birth outside the United States.

These results suggest that exposure to both *T. gondii* and *Toxocara* is common in the United States and could be explained through a common route of exposure of ingestion of contaminated soil. We caution that, although the largely seronegative results of *T. gondii* IgM testing suggest that most of the *T. gondii* IgG–positive individuals had been infected for ≥6 months, exposure to these 2 parasites may not have occurred at the same time, because the *Toxocara* IgG serology cannot differentiate between recent and remote infection [6].

A similar association between exposure to *T. gondii* and *Toxocara* was observed in the previous NHANES survey, 1988–1994 [7]. Both toxocariasis and toxoplasmosis can be prevented by hand washing after contact with soil and reducing soil contamination by cat feces [8].

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Table 1.

Risk Factors for Toxocara Seropositivity, Accounting for *Toxoplasma gondii* Seropositivity, as Estimated With a Full Logistic Regression Model for All Persons ≥ 6 Years of Age, NHANES 2011–2014

Factor	OR (95% CI)
Age, y	
6–11	Reference
12–19	1.1 (.6–1.9)
20–29	1.3 (.7–2.3)
30–39	1.2 (.6–2.1)
40–49	1.4 (.8–2.4)
50–59	1.8 (1.0–3.4)
60–69	1.4 (.9–2.4)
≥70	2.0 (1.1–3.8)[a]
Race/Hispanic origin	
Non-Hispanic white	Reference
Non-Hispanic black	1.4 (1.0–1.9)[a]
Non-Hispanic Asian	0.8 (.5–1.3)
Mexican American	0.6 (.4–1.0)
Other Hispanic and other race	1.1 (.7–1.6)
Sex	
Female	Reference
Male	1.8 (1.5–2.2)[b]
Relationship to poverty level	
Below	1.9 (1.4–2.5)[b]
At or above	Reference
Crowding index, persons/room	
≥0.5	1.3 (1.0–1.6)[a]
<0.5	Reference
Head of household's educational level	
Less than college	1.8 (1.4–2.3)[b]
At least some college	Reference
Place of birth	
Other	3.1 (2.1–4.4)[b]
United States	Reference
T gondii seropositivity	
Negative	Reference
Positive	2.2 (1.7–2.9)[b]

Abbreviations: CI, confidence interval; NHANES, National Health and Nutrition Examination Survey; OR, odds ratio.

[a] $P < .05$.

[b] $P < .001$.