

TOXOPLASMOSIS ACTIVITIES IN CONNECTICUT, 2001-2003

Toxoplasmosis is an infection caused by a single-celled parasite called *Toxoplasma gondii*. Infection occurs: by ingestion of undercooked meat containing tissue cysts or by ingesting oocysts deposited in the environment; by blood transfusion or solid organ transplantation; or transmission from a mother to a fetus through the placenta (1,2).

Illness is generally asymptomatic or mild; however, it can be a potentially severe disease in infants and persons with compromised immune systems. In the United States (US), 3% of illnesses due to foodborne transmission are caused by parasites, and toxoplasmosis is the third leading cause of death due to foodborne transmission (3).

A national serosurvey of *T. gondii* antibodies indicated that infection is common: 23% of the population aged ≥ 12 years were seropositive with the highest rates occurring in the Northeast (29%) (4). However, there are few data in the US and, prior to recent efforts, none in Connecticut on the incidence of infection, the overall burden of disease due to *T. gondii*, and trends in its occurrence. The following summarizes toxoplasmosis surveillance activities in Connecticut since 2001.

Surveillance Data

Beginning January 1, 2001, toxoplasmosis became a physician and laboratory reportable disease in Connecticut. The primary objectives of surveillance were to: 1) determine the incidence and risk factors for acquiring toxoplasmosis; and 2) monitor trends over time, especially in infants, children, pregnant women, and the immunocompetent.

Surveillance included passive reporting from laboratories and physicians and enhanced statewide case finding through ophthalmology offices. For passive surveillance, it was recommended that laboratories report those results

In this issue...

Toxoplasmosis Activities in Connecticut, 2001-2003	21
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considered significant (IgM positive, significant IgG titers, positive PCR results).

In 2001, all laboratory reports of IgM and/or IgG seropositivity were followed-up with the ordering physician by Connecticut Emerging Infections Program, Foodborne Diseases Active Surveillance Network (FoodNet) staff to determine the reason for testing and whether the patient had any clinical findings consistent with *T. gondii* infection. Beginning in 2002, follow-up information was collected on immunocompetent persons who were IgM positive, or had clinical symptoms consistent with *T. gondii* infection, or were reported by an ophthalmologist.

Between January 2001 and November 2003, 428 reports were received: 422 from laboratories and 6 from health care providers (Table 1) representing 408 patients. Of the 408 patients, 159 (39%) are from a single transplant practice that indicated routine screening of all their patients. Excluding the transplant practice, follow-up information has been received for 102 patients (41%). Of these, 72 (71%) are immunocompetent, and 30 (29%) are immunocompromised.

Of the 72 immunocompetent patients, 48 (67%) had positive IgM serology results and/or IgG results with clinical findings indicative of possible *T. gondii* infection. Patient-specific information for these 48 patients is shown below.

- 17 pregnancy related (7 IgG + , 6 IgM + and 4 IgG and IgM +)
- 16 with ocular findings (8 IgG +, 4 IgG and IgM +, 1 IgM + only, and 3 with a clinical diagnosis)
- 7 with lymphadenopathy (5 IgM + and 2 IgG and IgM +)
- 2 with fever (IgG+)

Table 1. Toxoplasmosis reports by year, 2001-2003

Reports	2001	2002	2003*	Total
Laboratory				
IgG +	154	92	117	363
IgM +	6	19	13	38
Both +	12	5	4	21
Physician	2	3	1	6
Total + *preliminary data	174	119	135	428

- 2 asymptomatic (1 IgG and IgM + , 1 IgM+)
- 1 IgG + with fatigue
- 1 newborn IgG + with hydrocephalous and liver disease
- 1 newborn IgG + with no symptoms but mother is seropositive
- 1 child IgG and IgM + with Lyme disease.

These 48 patients ranged in age from 3 weeks to 71 years (median: 35 years); 69% were female.

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Survey of Ophthalmologists

T. gondii, one of the most common causes of infectious chorioretinitis, accounts for approximately 25% of posterior uveitis cases in the US (5). Estimates of 400-4,000 cases of congenital toxoplasmosis occur annually in the US (4). Most infants with congenital toxoplasmosis have no signs at birth; however, the development of ocular disease occurs in up to 85% of these children by the age of 20 (6-8). Postnatally acquired *T. gondii* infection can also produce ocular disease.

Persons with symptomatic congenital or acquired *Toxoplasma* chorioretinitis are usually seen by an ophthalmologist. As an initial step in characterizing the burden of toxoplasmosis and to increase awareness among ophthalmologists of their importance in *Toxoplasma* surveillance, FoodNet staff surveyed ophthalmologists to: 1) assess which specialties were most likely to see these patients; 2) document the criteria used to make the diagnosis; and 3) develop an estimate of *Toxoplasma* cases seen by ophthalmologists in Connecticut.

In August 2001, a survey was sent to 297 ophthalmologists. A second mailing was sent to non-respondents 6 weeks later. Responses were received from 222 (75%) ophthalmologists. Of these, 165 (74%) met the eligibility requirements of having practiced at least 8 hours a week in Connecticut and having seen a case of uveitis or retinal scarring from January 2000 to November 2001. These respondents represent the following specialties: 101 (61%) general ophthalmologists, 25 (15%) retina vitreous specialists, 7 (4%) pediatric ophthalmologists, and 32 (19%) other specialists (Table 2).

Table 2: Summary of ophthalmologist survey results by type of practice.

Type of Practice	Overall (%)	Seen at least one case* (%)	Significant RR (95% CI)	Mean Cases* seen (range)	Significant t-test
General Op	101 (61)	62 (61)	--	2.6 (0-25)	--
Pediatric Op	7 (4)	5 (71)	--	2.3 (0-7)	--
Retina Vitreous	25 (15)	24 (96)	1.6 (1.3-1.9)	7.5 (0-30)	P<0.001
External Disease/Cornea	17 (10)	13 (76)	--	1.6 (0-6)	--
Glaucoma	8 (5)	1 (12)	--	0.1 (0-1)	--
Other	7 (4)	2 (29)	--	0.4 (0-2)	--

* Case = patient with posterior uveitis or retinal scarring due to toxoplasmosis.

Overall, 107 (65%) ophthalmologists reported seeing at least one case of posterior uveitis or retinal scarring attributed to toxoplasmosis; 59 (64%) believed at least one of their cases had been seen by another ophthalmologist. Fifty-five (51%) ophthalmologists surveyed based their diagnosis of toxoplasmosis on clinical appearance alone, 35 (33%) used a combination of clinical appearance plus serology, and two (2%) used clinical appearance, serology and reactivation of a known scar. Retina-vitreous specialists were more likely than general ophthalmologists to have used serology to make the diagnosis (67% versus 21%; $p < 0.01$).

Ophthalmologists reported seeing approximately 495 cases of ocular disease attributed to toxoplasmosis. Of these, 173 (35%) were considered to be reactivated congenital toxoplasmosis, and 15 (3%) recently acquired toxoplasmosis. The remaining 307 (62%) were not considered to have active disease; therefore, the ophthalmologist did not specify whether the infection was congenital or acquired. Respondents estimated 125 (25%) had been seen by another ophthalmologist. After adjusting for the 125 cases seen by more than one ophthalmologist and 75 non-responders, ophthalmologists saw an estimated 250 cases of ocular toxoplasmosis annually (estimated annual prevalence rate of 7.3 cases per 100,000 population). Retina-vitreous specialists were more likely than general ophthalmologists to have seen a case (96% versus 61%; $p < 0.01$), and tended to see a larger number of cases when compared with other ophthalmologists (mean: 7.5 cases versus 2.2 cases; $p < 0.001$, t-test).

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Editorial Note:

Surveillance for acute toxoplasmosis is challenging, and past estimates of the burden of disease and economic impact are based on limited data. In Connecticut, surveillance showed laboratory and physician reporting is inconsistent and often incomplete. Although laboratories are asked to report significant results, the interpretation varies by laboratory. There are also limitations to the

serodiagnostic tests. Laboratory-based surveillance is further complicated by mixing screening tests with diagnostic tests. We chose to conduct enhanced surveillance among ophthalmologists who may be most likely to see patients with active *T. gondii* infection.

Most infants with congenital toxoplasmosis are asymptomatic at birth and frequently do not develop ocular disease until many years later. In addition, most pregnant women are not tested for *T. gondii* infection in the US and are not symptomatic when they are acutely infected. As a result, they are not aware of transmitting the infection congenitally. Even severe congenital manifestations (e.g., stillbirths, blindness, neurologic deficits) may not be attributed to toxoplasmosis.

Persons with symptomatic congenital or acquired ocular disease are usually seen by ophthalmologists. Recent reports suggest that more cases of ocular toxoplasmosis may actually result from acute infections acquired after birth than from congenital disease (9,10).

As reported here and elsewhere, the diagnosis of ocular toxoplasmosis is essentially made on the basis of clinical findings, although serology is helpful for differentiating acute (IgG and IgM antibodies) from chronic infections (IgG antibodies) and for ruling out the diagnosis of toxoplasmosis (no IgG antibodies) (11). Data from the survey reported here indicate that there is a significant amount of clinical disease associated with toxoplasmosis and that ocular toxoplasmosis is commonly diagnosed by ophthalmologists.

Recommendations for the prevention of toxoplasmosis are found in Table 3.

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In This Issue...	Toxoplasmosis in Connecticut
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Table 3: Recommendations for Prevention of Toxoplasmosis

Most *Toxoplasma gondii* infections are transmitted to people by eating undercooked meat containing *T. gondii* bradyzoites, congenitally through the placenta, or by ingestion of soil or water contaminated by *T. gondii* oocysts from the feces of infected cats (for example while gardening or handling unwashed vegetables).

- Meat, especially pork, lamb, or wild game, should be cooked to 160° F (71° C) using a meat thermometer.
- Cutting boards, dishes, counters, utensils, and hands should be washed with hot soapy water after any contact with raw meat or unwashed fruits or vegetables.
- Hands should be washed thoroughly after gardening or contact with soil or sand.
- Pregnant women should avoid changing cat litter or wear gloves and wash their hands thoroughly afterwards.
- Cat litter boxes should be changed daily because *T. gondii* oocysts excreted in cat feces require more than one day to become infectious.
- Cats should not be allowed to hunt and should not be fed raw or undercooked meat so they do not become infected with *T. gondii*.

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