

## ***Toxoplasma gondii* Antibody Seroprevalence in U.S. Swine**

### **Background**

*Toxoplasma gondii* is a single-celled parasite that exists worldwide. Infection with *T. gondii*—toxoplasmosis—can occur in many warm-blooded animals such as sheep, goats, and pigs. People can become infected in multiple ways, including (1) ingestion of eggs (oocysts) from contaminated food, water, or the environment; (2) ingestion of raw or undercooked meat from infected animals, such as pork and lamb; or (3) transplacental transmission and subsequent fetal infection.<sup>1,2</sup>

A recent national survey of U.S. households by the CDC showed that, overall, 13.2 percent of people 6 years of age or older have been exposed to *T. gondii* as evidenced by antibodies present in blood samples.<sup>3</sup>

*T. gondii* has a complex life cycle. Cats are the definitive host and serve as a reservoir of infection for pigs and humans. One aspect of controlling toxoplasmosis in pigs is to keep cats and their feces away from pigs and feed storage areas. Other important measures include eliminating cannibalism of dead pigs, controlling rodents, and not feeding uncooked garbage (with meat scraps) to pigs.<sup>1,2</sup>

### **Swine 2012 study**

In 2012, USDA's National Animal Health Monitoring System (NAHMS) conducted a study on swine health and management practices from a random sample of swine production sites in 13 States.\* The swine operations in these States accounted for about 91 percent of the U.S. pig inventory and 89 percent of U.S. pork producers with 100 or more pigs. Overall, 2,119 swine production sites participated in the first interview, conducted from July 16 through August 15, 2012.

As part of the Swine 2012 study, up to 30 blood samples were collected from late finishers and/or sows and gilts on 177 sites. Blood samples were collected from October 1, 2012, through February 1, 2013. A total of 3,933 samples were collected from late finishers on 137 sites and 1,772 samples were collected from sows and gilts on 68 sites. Blood samples were sent to USDA's Beltsville Agricultural Research Center and tested for antibodies by Tox-96 ELISA. The presence of antibodies indicates an animal has been previously exposed to the parasite.

\* Iowa, Illinois, Indiana, Kansas, Minnesota, Missouri, Nebraska, North Carolina, Oklahoma, Ohio, Pennsylvania, South Dakota, Texas.

### **Prevalence—late finishers**

Of the 3,933 blood samples collected from late finishers, results for *T. gondii* exposure were obtained from 3,923 samples. A total of 31 swine samples (0.8 percent) were positive. In the NAHMS 2006 Swine study, which had a similar study design and laboratory protocol, 2.7 percent of late finishers were positive for antibodies to *T. gondii*.

Of the 137 sites from which blood samples were collected from late finishers, 21 sites (15.3 percent) had 1 or more positive samples. In Swine 2006, 21.6 percent of sites had swine positive for *T. gondii* antibodies.

More than 70 percent of the positive sites in 2012 (15 out of 21) had only 1 positive sample (table 1).

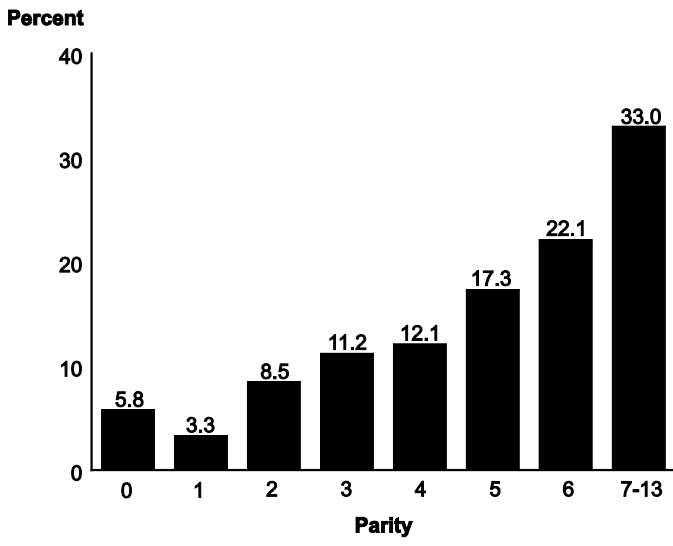
**Table 1. Number and percentage of sites by the number of positive late finishers**

<b>Number positive samples</b>	<b>Number sites</b>	<b>Percent sites</b>
0	116	84.7
1	15	10.9
2	3	2.2
3	2	1.5
4	1	0.7
Total	137	100.0

### **Prevalence—breeding females**

Of the 1,772 blood samples collected from sows and gilts, *T. gondii* antibody results were obtained from 1,766 samples. A total of 185 swine samples (10.5 percent) were positive. Breeding females are more likely to be positive for *T. gondii* antibodies than late finishers because they are older and have had more chances to become exposed to the parasite. The percentage of sows and gilts that were positive increased with parity, from a low of 3.3 percent of parity 1 sows to 33.0 percent of sows that were parity 7 or higher (figure 1).

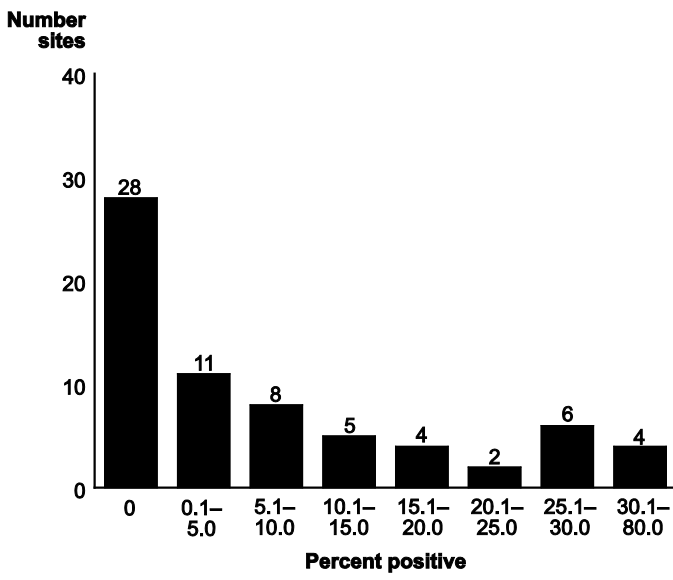
**Figure 1. Percentage of breeding females positive, by parity**



Of the 68 sites from which blood samples were collected from sows and gilts, 40 sites (58.8 percent) had 1 or more samples positive for *T. gondii* antibodies.

The distribution of positive sows and gilts on positive sites varied more than in late finishers. On 10 of the positive sites, more than 25 percent of blood samples from breeding females were positive for antibodies to *T. gondii* (figure 2).

**Figure 2. Number of sites by percentage of breeding females positive**



Cats play an important role in the transmission of *T. gondii* among swine. In the past, cats were commonly used to control rodents on swine farms. Among the breeding sites that used cats for rodent control, almost 70 percent (68.9 percent) had at least one sow or gilt positive for *T. gondii* antibodies, whereas 39.1 percent of breeding sites that did not use cats had at least one positive sow or gilt.

### Prevalence—early NAHMS studies

NAHMS swine studies conducted in 1990, 1995, and 2000 also tested swine for antibodies to *T. gondii*. Because a different diagnostic assay and laboratory were used, results are not directly comparable with more recent NAHMS studies (2006 and 2012). However, the percentage of breeding females that were positive in 1990, 1995, and 2000 showed a steady decline—19.5, 15.1, and 5.8 percent, respectively. Late finishers were not tested in 1990 but the percentages positive in 1995 and 2000 were 3.2 and 0.8 percent, respectively.<sup>4</sup>

### Conclusions

Since 1990, NAHMS studies have shown an overall decline in the apparent prevalence of *T. gondii* in U.S. swine. In a consistent pattern, a higher percentage of breeding females than late finishers have been positive for antibodies to *T. gondii* antibodies. The findings in the NAHMS Swine 2012 study are consistent with these patterns. Producers are encouraged to continue efforts to reduce occurrence of *T. gondii* on their operations, such as by preventing cats from accessing facilities on swine farms because of their likely role in transmitting *T. gondii* to swine.

### References

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