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TRANSLATION NO. 30

Translated from Russian by Frederick K. Plous, Jr.  
Edited by Norman D. Levine

Kuzovkin, Ye. M. 1970. Toksoplazmy i toksoplazmoz u dikogo kabana (Sus scrofa Lin., 1758). Toxoplasma and toxoplasmosis in the wild boar (Sus scrofa Lin., 1758). Voprosy Prirodnoi Ochagovosti Boleznei. [Contributions on the Natural Nidality of Diseases.] Alma-Ata, Kazakhstan, USSR. 3:50-56.

Toxoplasmosis is a zoonthroponosis characterized by the phenomenon of natural nidality (Galuzo, 1956; Hoare, 1961; Jirovec, 1961 and others). Wild animals play an important role in the spread of the disease agent in nature.

According to published data, boars are highly sensitive to many infectious and infestations diseases, the latter causing them considerable loss, so that the possibility is not excluded that they are also sensitive to the agent of toxoplasmosis.

In analyzing the literature on toxoplasmosis of wild boars we found only 2 papers by foreign investigators. Using the Sabin-Feldman test, Walton and Walls (1964) studied 8 wild boars and obtained negative results. Rommel, Sommer and Janitschke (1967), using the same reaction, examined 54 boars and got positive results in 18 (33%) of the animals at titers ranging from 1:4 to 1:1,000. Avirulent strains of Toxoplasma were isolated on the 4th passage from the heart and diaphragm muscles by bioprobe. The data from our studies (Kuzovkin, 1965) also attest to the widespread spontaneous presence of Toxoplasma among wild boars (from 19 to 30.9%).

In order to clarify the susceptibility of these animals to Toxoplasma, 6 boars reacting negatively to the complement fixation reaction (CFR) for toxoplasmosis were experimentally infected. The Toxoplasma was introduced intramuscularly, intraperitoneally, thru the conjunctiva, intranasally, subcutaneously and intravenously. The inoculate was the peritoneal exudate of white mice that had been infected by Toxoplasma strain SDK-1, isolated from domestic swine (Kuzovkin, 1963). The dose of Toxoplasma was determined in a Goryayev chamber.

All the infected boars died (see table); the disease was acute, subacute or chronic.

In boars No. 6 and 2, on the 3rd and 4th days after infection, there was a rise in temperature, refusal of food, muscular trembling, thirst, diarrhea and, in boar No. 2, paralysis of the posterior extremities on the day before death. On the eve of death both animals had a sharp drop in body

temperature to 34.6°C. In boars 3 and 5 clinical signs of disease were observed 4-5 days after injection: the general state of the animals was depressed, with lack of appetite, shortness of breath, profuse diarrhea and progressive emaciation. On the 16th day boar No. 5 died in a state of severe exhaustion and posterior paralysis. Boar 3 had acute deterioration of its general condition on the 7th day: complete refusal of food, pus from the conjunctiva and paresis, altho body temperature was sub-febrile (40.4°C). The eyelids were swollen, the conjunctivae dark-red, and a pussy exudate flowed from the inner corners of the eyes. On the 12th day the body temperature dropped sharply (36.4°C). As before, there was conjunctivitis with pus, and patches of shading appeared on the corneas of both eyes. On the 18th day a secondary rise in body temperature set in and continued for 3 days; on the 24th day the animal died with posterior paralysis, cachexia and complete opacity of the corneas of both eyes.

Along with symptoms of a total, generalized infection (high fever--41.9°C--shortness of breath, posterior paresis, tremor, enteritis), boar 1, like boar 3, showed the characteristic involvement of the eyes. In this animal the infection lasted 64 days, including a 3-day incubation period. During this time 3 acute periods were noted and the boar's condition was apparently satisfactory every 5-10 days. Progressive emaciation, destruction of the general body tonus and repeated attacks of the disease probably served as factors serving to break down the hemophthalmic barrier and admitting Toxoplasma carried by the bloodstream or lymph into the eyes. The pathologic process developed simultaneously in both eyes. After the 2nd attack conjunctivitis and a discharge of pus from the conjunctiva were observed (Fig. 1). Later dehydration of the sclera and thickening of the conjunctivae at the inner corner of each eye were observed. Ultimately the corneas developed spots, and complete blindness then ensued. On the 64th day of infection the boar died. In boar 4 a rise in body temperature to 40°C was noted on the 5th day of infection. The animal had profuse diarrhea, hyperventilation, a serous discharge from the nose and inappetence. This state lasted 7 days, after which the temperature dropped to normal and the animal ate, but the profuse diarrhea continued as before. The boar grew noticeably thinner and died on the 38th day in a state of complete emaciation.

In general, the pathologoanatomical picture in the dead animals was present thruout the body.

Most often dissection of the boars revealed the following picture: lungs edematous, dark-red, filled with a pale-pink exudate; liver enlarged, small necrotic foci visible on its surface as white spots; spleen enlarged, half-full, in sections the pulp yielding abundant scrapings, the surface covered with a multitude of tiny white necrotic foci; intestinal walls thickened (fundal part), mucosa dark-crimson; mucosa of small intestine hemorrhagically congested, forming large folds covered with mucus mixed with fibrin; mediastinal mesentery lymph nodes enlarged, dark-red in sections. Eyes with complete opacity of the cornea (boars 1, 3), the conjunctiva swollen, red.

The pathologoanatomical picture depended on the duration of the disease. In the acute and sub-acute cases (boars 2, 3, 5 and 6) the organs of respiration were most often involved; in longer illnesses (boars 1 and 4) other organs (most often the gastro-intestinal tract) were pathologically altered.

In order to learn the localization patterns of Toxoplasma in the body, bioprobes on white mice were run, using infected organs of all the boars. Toxoplasma was isolated from the eyes (sclera, cornea, aqueous and vitreous humor), bone marrow, liver, spleen and lungs of boars 1 and 3. Toxoplasma was found in the skeletal musculature and lymph nodes of boar 1 and from the liver, brain, mesenteric lymph nodes and mucosa of the transverse colon of boar 4.

Microscopic smears revealed parasites in the bone marrow, lungs, mesenteric lymph nodes and aqueous humor of boar 1; smears of lung, liver and mesenteric lymph nodes were obtained from boars 2, 5, 6 and from the livers of boars 3 and 4.

Another confirmation of experimental data appeared in the results of a study of boars spontaneously infected with Toxoplasma, which revealed that toxoplasmosis has a significant distribution among these animals. Of 105 animals studied, 36 (34.3%) gave positive CFR's. These data are confirmed by the results of Rommel, Sommer and Janitschke's (1967) studies.

Microscopic examination of impression smears from organs revealed Toxoplasma in the blood, spleen, kidney and brain tissue of 3 animals. On the CFR for toxoplasmosis these boars had reacted positively at a three-plus level at a titer of 1:10.

The internal organs (lungs, liver, spleen, lymph nodes) of 50 wild boars caught along the lower river Chu were used to set up group bioprobes on white mice. Before the opening of the bioprobes the material from these organs was kept in a frozen state for one month. Each bioprobe made use of material from 10 animals. Reinoculation on blind passage was conducted over a period of a month to a month and a half. On the 2nd passage in a bioprobe using lymph-node material from 10 animals Toxoplasma cysts of an avirulent strain were observed in white mice. White mice were reinoculated 30 days later with this same strain. When this was done the white mice did not die but developed a general anemia, while their brains were seen to harbor a large number of Toxoplasma (Fig. 2).

#### Evaluation

According to published data and our own studies, toxoplasmosis is widespread among wild boars, and under experimental conditions these animals are susceptible to toxoplasmosis. Under different forms of inoculation the disease manifests itself clinically and ends lethally.

In their search for food boars may come in contact with farm animals and thereby transmit toxoplasmosis to the latter. Man, in turn, may become infected from these farm animals when he comes into contact with them during slaughtering and butchering operations. The result is the establishment of an anthropourgic nidus of toxoplasmosis. The boar, being a commercial animal, is also capable of transmitting toxoplasmosis directly to man.

Considering all that has been said, it may be assumed that these animals play a large role in the maintenance of a natural nidus of toxoplasmosis.

### Conclusions

1. Under experimental conditions wild boars are sensitive to toxoplasmosis to a significant degree. In all 6 of the infected animals the disease ended lethally. The characteristic clinical symptom was involvement of the eyes.
2. Spontaneous Toxoplasma antibodies were observed in 36 (34.3%) of 105 boars studied with CFR's.
3. Toxoplasma was found microscopically in smears of kidney, spleen, and brain from 3 boars; the bioprobe method revealed it in the lymph nodes of 10 animals; in these cases the strain isolated was avirulent.

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Table

Results of experimental infection of wild boars by Toxoplasma SDK-1

Animal Number	Sex	Age in Months	CFR before infection	Infection		Form in which illness occurred	Outcome of infection	Notes
				Method	Number of <u>Toxoplasma</u>			
1	Male	12	0	Intra-muscular	$16 \times 10^3$	Chronic	Death on 64th day	Ocular involvement with complete blindness
2	Male	4	0		$2 \times 10^6$	Acute	Death on 11th day	
3	Female	8	±	Intra-peritoneal	$5.1 \times 10^4$	Subacute	Death on 24th day	Eye involvement with destruction of vision
4	Male	8	0	Intranasal	$2.55 \times 10^6$	Chronic	Death on 38th day	
5	Female	6	0	Subcutaneous	$2 \times 10^6$	Subacute	Death on 16th day	
6	Male	6	0	Intravenous	$2 \times 10^5$	Acute	Death on 9th day	