

## ***Toxocara canis* (Werner, 1782) Eggs in the Pleistocene Site of Menez-Dregan, France (300,000-500,000 Years Before Present)**

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*On the archaeological site of Menez-Dregan in Brittany, France, dated 300,000-500,000 years-old, paleoparasitological analysis of cave deposits led to the detection of well-preserved helminth eggs, which morphology and morphometry pointed to the diagnosis of *Toxocara canis* eggs, a parasite of carnivore mammals. Paleolithic remains suggested a parasitism of the hyena *Crocota spelaea* or other canids that inhabited the region.*

Key words: paleoparasitology - ancient parasitism - parasite fossil record - *Toxocara canis* - paleofauna

The archaeological site of Menez-Dregan (Plouhinec, Finistère) is a collapsed cave near the shore in Brittany. Excavations were performed since 1991 (Hallegouët et al. 1992). They revealed human occupation levels dated 300,000 to 500,000 years old (Paramagnetic Electronic Resonance) (Monnier et al. 1994, Miallier et al. 2000). Lithic artifacts were identified as "Colombanien" (Monnier & Molines 1993), characteristic of a well-known period in Europe. Human-made hearths are associated with these old dates. Evidence indicates that fire must have been carefully maintained inside the cave. The paleoenvironment was temperate and oceanic (Monnier et al. 1996).

Sediment samples from layers 5e, 7, and 9a were examined for parasites. These layers were chosen as they revealed human remains such as lithic artifacts and preserved organic material. Fragmented bones were recovered only from the 5e and the 9a layers.

Samples were rehydrated for 5 weeks in a 0.5% aqueous trisodic phosphate solution. A 5% glycerinated solution was added and the material was then crushed in a mortar. The suspension was treated in ultrasonic device (Sonorex 103K) at 60°C for 1 min and strained through 315-µm, 160-µm, 50-µm, and 25-µm meshes. The last two screenings were treated with flotation (densities 1.04 to 1.4) and sedimentation (1,500 rpm for 5 min) techniques (Bouchet et al. 2001).

Pollen recovery was performed using the classical chemical method adapted for this kind of sample (HF 50%, HCl 50%, and KOH 10%). After chemical treatment flotation process was performed in dense liquid medium (ZnCl<sub>2</sub>), required for the concentration of the spores and pollen grains from the residues of the sediment.

Parasite eggs were found only in the sedimentation preparations. Eggs were identified by their morphology and morphometry. Because there are no Pleistocene references they were compared to the local modern parasitic fauna (Chame 1992). For extinct animals, parasite check-lists of related hosts were also examined.

Helminth eggs were identified in the 7th layer sediment. Rounded nematode eggs measuring 90 µm in diameter with a thick, rough corrugated shell were identified as *Toxocara* eggs (Nematoda, Ascarididae) (Fig. 1).

*Toxocara* species are commonly found in wild and domestic animals. The eggs are identified by their thick corrugated shell, size and shape: *Neoascaris vitulorum* (Goeze, 1782), in cattle (egg size – 75 µm x 90 µm); *Toxocara canis* (Werner 1782), in Canids, dog (*Canis familiaris*), fox (*Vulpes vulpes*), wolf (*Canis lupus*), hyena (*Crocota crocuta*), and other carnivore mammals (egg size – 75 µm x 85-90 µm); *Toxocara cati* (Werner, 1902), in felid species (egg size – 70 µm x 75 µm); *Toxocara mystax* (Zeder, 1900) in lion (*Panthera leo*), leopard (*Panthera pardus pardus*), lynx (*Lynx lynx*) (egg size – 65-75 µm diameter) (Baer 1924, Baylis 1937, Levine 1968, Warren 1971, 1972, Graber et al. 1980, Jooste 1989).

The hyena *Crocota spelea* was the predominant carnivorous species during Pleistocene times in the region (Guérin & Patou-Mathis 1996, Miskovsky 2002). This extinct species is close to present-day African spotted-hyena *C. crocuta*, which is found infected by *T. canis*, *Taenia crocutae*, *Diphyllobothrium* sp., *Toxascaris* sp., *Cylicospirura* sp., and *Dipylidium* sp. (Ferreira et al. 1993). This hunter-scavenger, large, carnivore seemed to occupy the same habitat and ecological niche as humans in the past. Humans and hyenas competed directly for food and dwelling. Although containing human remains, so far no human or other animal bones were recovered from layer 7 of Menez-Dregan. However, carbonized bone fragments were found in sediment microscope examination.

Size and shape of the eggs are consistent with of *T. canis* and the paleohyena or other canid, such as the wolf, could be ascribed as potential hosts. Eggs are very well preserved especially the fine net that covers *Toxocara*

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eggshell, as seen in Fig. 1 (Ubelaker & Allison 1975, Wharton 1980). Resistance to taphonomic processes may be explained by the chitinous shell structure (Ishii 1991, Bouchet & Leger 1985, Soulsby 1982).

Palynological analysis shows semispherical-shaped grains with three pores displaced slightly from the equator into one hemisphere (Fig. 2). Morphologically they can be identified as a *Carya* (Juglandaceae) pollen, a temperate plant genus found in Europe during upper Pleistocene time (500,000 years).

Regarding the parasite eggs found, these are the first to be mentioned in organic sediment dated from the Pleistocene. Previously parasite eggs and larvae were found in Pleistocene coprolites (Ferreira et al. 1993, Jouy-Avantin et al. 1999). The archaeological site of Menez-Dregan shows environmental aspects different from the sites located in dry mountain regions, such as Fontana Acetosa, Costa San Giacomo, Central Italy (Ferreira et al. 1993), and La Caune d'Arago, France (Jouy-Avantin et al. 1999). It seems that the humidity of the deepest layers of Menez-Dregan favored the preservation of organic material, including parasite eggs, but impaired fecal mineralization. The pollen finding also attest the good preservation conditions. These findings add new data to the knowledge of parasitic infection among Pleistocene extinct hosts.

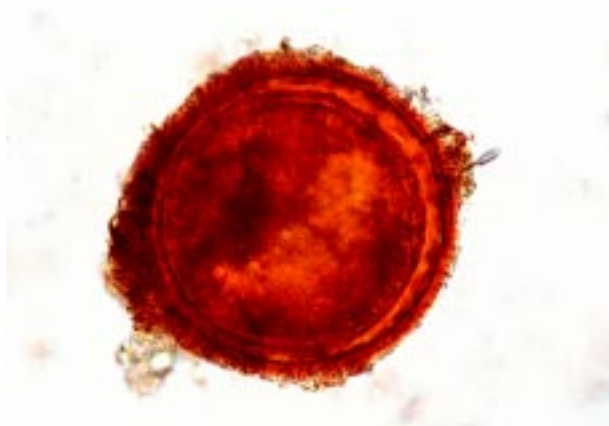


Fig. 1: *Toxocara canis* egg found in Menez-Dregan cave, France, dated 500,000 years-old.

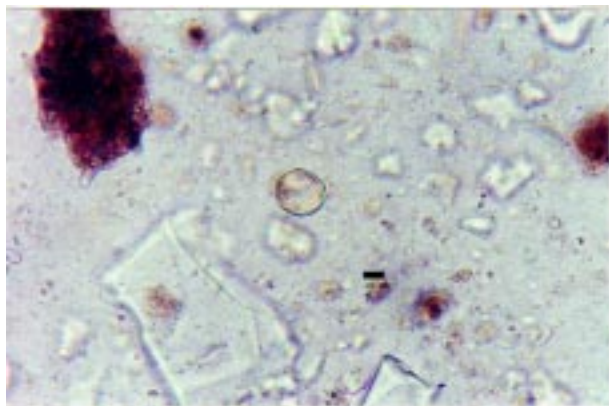


Fig. 2: *Carya* (Juglandaceae) Polar view (400X). Pollen from a sample collected in the Pleistocene site of Menez-Dregan, France.

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