

TOXOCARA (ASCARIDIDAE) EGGS IN A FRANCISCAN FROM PORTUGAL (XVII-XVIII CENTURY): CASE REPORT

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Franciscanism was established in Portugal in 1217 when friars Zacarias and Gualter were sent by San Francis of Assisi with the task of develop a religious propaganda, aiming the construction of new convents. The first convents were built in Leiria in 1232 and Porto in 1233 which started the custody of Portugal, with some autonomy inside the Spain province. The convent of the Holy Spirit was built in Mealhada, Loures in 1574 to welcome the Franciscan friars of the province of Santa Maria da Arrábida, being the most austere and humble in terms of rules and discipline of the remaining Franciscan provinces. The convent was responsible for integrate and train novices and teach Latin grammar, reading and writing, allowing a few more than 10 friars and novices. Also the hostel was integrated to the health itinerary, receiving patients on their way to the Hospital of All Saints in Lisbon.

The monks dressed humble garments made of wool (burel), and only the elderly and infirm could wear shoes, but some refused as a form of penitence. The produced handmade pieces were not for sale, only for divine worship in the chapels. The religious duties took much of their time with prayers for the deceased, funerals, processions, mental prayer and confessions of two and a half hours daily. The rest of the time was filled by domestic activities like washing habits and other clothes of the religious community, cleaning the convent, the transport of water to the service areas, assistance to the inn and the preparation of meals¹.



Building of the former Convent of Holy Spirit, nowadays



Cloister

The archaeological intervention in the cloister of the Convent of the Holy Spirit occurred in 2005. Throughout the covered gallery are observed sixteen graves arranged lengthwise. Each grave received more than one individual, only the most recent being preserved. The skeleton in burial 3 was a primary inhumation identified under the slab 16 in the northwest of the cloister, middling preserved. Some nails were found indicating deposition in a wooden coffin. There were no associated assets, however, taking as support the collected assets in the remaining graves of the cloister, we can frame this burial between the 2nd half of the 17th century and the 18th century².

During the delimitation of the skeleton it was identified a darker organic agglomeration in the anterior part of the sacrum which by appearance and localization was identified as fecal matter from the individual. The greenish pasty material did not presented any smell and it was collected to a sterilized plastic bag. Another sample from the surrounding soil was also collected for control.

Samples were rehydrated in 0.5% trisodium phosphate solution with commercial *Lycopodium* spore tablets batch 12542. After 3 days the samples were homogenized with a glass rod and then the swirl technique³ was applied to remove sand from samples. For analysis at least 20 slides of each sample were inspected at 100-400x magnifications in a light/polarized microscope.



Burial 3. Adult male, older than 30 years of age

The studied individual was a male, older than 30 years of age, an approximate stature of 175 cm, probably a friar. Paleopathological analysis revealed the loss of at least 15 teeth ante mortem. Remaining teeth (n=9) were located only in upper jaw and besides the absence of decay, presented moderate occlusal wear, severe tartar and linear hypoplasia of tooth enamel. In the appendicular skeleton was identified osteoarthritis and spinal column discarthrose is present in the cervical vertebrae. No bone changes consistent with infectious conditions and injuries were observed.

The sediment collected from the pelvic girdle revealed rounded yellow eggs with ornamented shell with a single mass in the interior (74,17 x 61,79 µm (n=37)) identified as *Toxocara* sp., (probably *Toxocara cati*) in a concentration of 2,766 eggs per gram. Dietary remains consisted of pollen grains of Asteraceae and Caryophyllaceae and several remains of plant ingestion as crystals from vegetables or fruits and scaly plant hairs compatible with wheat.

These results are consistent with the records of daily meals that could contain bread, wine, soup, fish, beef, lamb, rice, noodles, vegetables and fresh salad from the garden and orchard maintained by the friars. On feast days would be served sweets, fruit and cheese. Saturdays were reserved for fasting⁴. The water that supplied the kitchen and hall came from a nearby spring canalized till the interior of the convent. The control sample did not reveal any parasitological or dietary remains.



Toxocara sp. egg found in burial 3.

External contamination was discarded considering the depth of the burial and absence of violation signs. This is also supported by absence of food remains in the control sample supporting that the microfossils found in the pelvic sediment were the result of food consumption. *Toxocara canis* and *T. cati* are the most common parasites infecting dogs and cats respectively, worldwide. Carnivores get infected by ingesting *Toxocara* eggs that hatch in the intestines releasing a larva that, once in the bloodstream, reach the trachea, enter the esophagus and get swallowed to get back to the small intestine where they mature into adult worms, releasing eggs that are eliminated in feces. Trans placental and trans mammary routes of infection are common. In humans the infection with *Toxocara* species is usually known as visceral larva migrans because the larva doesn't complete the life cycle in the human host. Once in the bloodstream the larva infiltrates tissues and organs producing small tunnels with inflammatory and allergic reactions. Most infections are asymptomatic but some cases may be more serious depending on the affected organ, as in neurological cases than can lead to death⁵.

The soil contaminated with infective eggs is the source of infections. Humans usually get infected by ingesting food or water contaminated. Dirty hands and geophagy are also important transmission modes⁵. Less commonly infection can be associated with the ingestion of raw meat of paratenic hosts such as mammals, birds⁶ and snails⁷.

The presence of adults of *Toxocara* in humans is rare, and it has been usually attributed to ingestion of adult worms and not the development of the larval stage in this host⁸. There are however some cases where children eliminated a large amount of worms of *T. cati*^{9, 10}. Possible explanations for the presence of *Toxocara* eggs in this study are: (1) ingestion of eggs in contaminated food or geophagy hours before death. (2) Ingestion of adult worms containing eggs that are adapted to survive for long periods in soil: each female of *Toxocara* may produce around 200.000 eggs/day so the presence of a single fertile female could explain the concentration found in this study for both the intake of adult worm or the next hypothesis: infection (3) with an adult worm eliminating eggs, but no such case has been confirmed so far.

It seems more likely that worms or eggs were ingested in great amounts with food and the source of infection could be fecal contamination of the garden with cat/dog feces. There are records that the friars could have pets¹¹, but cats and dogs from outside could pass through the fence and defecate in the garden attracted by the soft ground, rodents, moles and birds feeding on vegetables and fruits. The ingestion of unwashed vegetables and fruits could infect the friars but also larvae could penetrate on bare feet. Even not sure if this report refers to a case of spurious parasite or true infection, it represents the first report of *Toxocara* eggs associated with human burial.

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