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HELMINTHIC INFESTATION IN A 19TH CENTURY MUMMY IN HUNGARY

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Abstract: *During reconstruction works, 265 naturally mummified individuals and an ossuary containing the remains of approximately 40 specimens were uncovered from the crypts of the Dominican Church at Vác, Hungary in 1994–1995. The specimens were buried continuously during the period of 1731–1841. Individual analysis was started with the body registered No. 44. The autopsy of the corpse of the 36-year-old man was carried out according to recent pathological practices. During the histological analysis the authors found intestinal parasites, Ascaris lumbricoides and their ova.*

Keywords: *Intestinal parasite; Ascaris; Histology; Mummy; 19th century; Hungary.*

Introduction

The systematic analysis, autopsy and histological examination of Egyptian mummies were started at the beginning of the 20th century. In 1910 Ruffer was the first to publish that he managed to discover the presence of *Schistosoma* (formerly *Bilharzia*) *haematobium* ova in the renal concretions of two 20th dynasty (1250–1000 B.C.) mummies. Schistosomiasis is endemic in Egypt of our times and the data of Ruffer indicated that it could have been a common disease three millenia earlier as well. Later researchers established the fact, that half of the mummified corpses from ancient Egypt, Nubia and the Sudan presented traces of schistosoma infestation independently of age (15–50 years) and of sex (Miller et al. 1992). *Schistosoma* infestation could be identified in a considerable number of mummies from all periods starting with predynastic times (3300–2920 B.C.) to the end of antiquity (around 500 A.D.; Miller et al. 1992).

Not just schistosomiasis, but other helminthic diseases were also common in ancient Egypt. *Ascaris lumbricoides* was discovered among other diseases by Cockburn et al. (1975). Several authors found helminthiasis (*Taenia*, *Trichuris*, *Ascaris*, *Oxyuris* infestations) in Egyptian mummies.

Parasite infestations seemed to be worldwide distributed in ancient and prehistoric times. ASPÖCK and his team investigated well-preserved human excrements from the Early Iron Age salt mines of Halstatt (Aspöck, Flamm et al. 1973) and Hallein. They were heavily infested with *Trichuris trichiura* (Aspöck, Barth et al. 1973). In 1995 Aspöck et al. discovered *Trichuris* (probably *trichiura*) from the mummy of Neolithic Period exposured from the Ötztaler Alps. Wei (1972) discovered *Schistosoma*, *Enterobius vermicularis*, *Trichuris trichiura* helminth fragments in the mummy of a Chinese woman who died at the age of 50 some 2100 years ago. *Enterobius* infection was established in a pre-Columbian mummy (Allison et al. 1974). Trichinelliasis was found in medieval ice-mummies (Wells 1984–85). *Trichinella* infestation was also discovered in Greenland ice-

mummies (Zimmerman and Aufderheide 1984). This latter case is especially interesting since *trichinelliasis* was discovered in all members of a frozen Eskimo family as well.

A number of authors claim that tapeworm infestation was so common in the ancient Middle-East (especially pigs were highly infested) that diet rules of Moses (3, Moses 11, 2–47), the prohibition of pork-consumption, were direct efforts to prevent human taeniasis (A. R. 1974).

The number of data on etiology and epidemiology of human helminthic diseases started to grow in bounds and leaped when it became evident, that verminal egg and even helminth remains were isolable in the material of trash-pits and dung-pits as well as in the soil-samples taken from the pelvis of skeletons (Fry and Moori 1969). In the last three decades it was possible to identify *Enterobius vermicularis*, *Diphyllobothrium pacificum* (Araujo et al. 1983), *Trichuris trichiura* (Contalonieri et al. 1981), *Strongyloides stercoralis, Ascaris lumbricoides* (Reinhard et al. 1988) and a number of other verminal eggs.

In Hungary it was not the palaeopathological but the natural historical literature that started to deal with helminthiasis as early as the 16th–17th centuries. Méliusz Juhász (1578) wrote about several medicinal herbs of his times that they "purge (deworm) man of worms". These statements probably ment *nemathelminthes* (*Ascaris lumbricoides*).

The Hungarian palaeopathological literature produced no publication on endoparasitosis yet and only a recent study treated ectoparasites (Pap and Józsa 1990). Here we intend to give a brief account on the intestinal worm remains found in the process of the autopsies, histological and laboratory analysis of the recently uncovered mummies of Vác.

Material

During reconstruction works a large series of well-documented, naturally mummified individuals came to light during reconstruction works at the Dominican Church at Vác, Hungary in 1994–1995 (Zomborka 1966, Susa et al.1996). The specimens were buried continuously during the period of 1731–1841. 265 naturally mummified individuals were discovered in the crypts of the church, and approximately 40 individuals' remains in the ossuary ere uncovered from the crypts (Pap et al. 1997, Szikossy et al. 1997). Natural mummification was possible due to the excellent climatic donditions.

Citizens of the flourishing small town Vác as well as some clericals were buried in the crypts. The registers of deaths kept at the parsonage and the painted texts on the coffins provide the exact date of death as well as the names, sex and age of the mummified individuals. Their origin and social status can also be established by further research. Most of the individuals were the members of the civil society of the town, some of them were clericals.

Individual analysis was started with the body registered No. 44. The late Antal Simon was a priest and a teacher, and he was the director of the Institute of Deafs during the period of 1802–1808. He was born in Ikrény on the 7th of September, 1772. He was comparatively young, 36 years old when he suddenly died and he was buried in the crypt of the Dominican Church on the same day, the 30th of August, 1808.

The corpse was exposured after 187 years of time since death. The body was mummified in natural way. But the mummification process is advanced only on the limbs, on the thoracic and the abdominal regions. The body is crumbling and it is disarticulated

in the zone of the cervical vertebrae. The skull is partially skeletalized. It bears remains of soft tissues dried up. We did not find macroscopic traces of injury or lesion either on the skull or on the well mummified remains of the body that could indicate anything that had something to do with the death of the deceased. Morphological alterations resulting from some disease were also not possible to observe on the remains (Susa et al. 1996, Pap et al. 1997).

Methods

CT analysis were carried out at the Diagnostic Centre of the Pannon University of Agriculture, Kaposvár. The examinations were carried out by means of Siemens Somatom Plis 40 CT equipment. The autopsy of the corpse of the 36-year-old man was carried out according to recent pathological practices. Macroscopic identification of the right lung, the liver, the kidneys, bowels, skeletal muscles, skin, hair and bones was possible. Samples were taken for laboratory analysis from the brownish-grey debris found in the large pelvis while samples were taken for histological examination from the other organs and tissues.

1. Laboratory analysis

We attempted to isolate helminth egg by sedimentation and flotation processes (Bálint 1962) in the material found in the large pelvis. We also tried to identify blood-traces by the quajacole-method.

2. Histological analysis

We rehydrated and fixed the samples from twelve organs and tissues in Ruffer-solution (alcohol : water : sodium carbonate) and in a mixture of alcohol : formalin : water : sodium carbonate. After washing them in distiled water we dehydrated the tissue fragments in an ascending alcohol (30–40–50–70–96–100%) and then we embedded the tissue pieces in paraffin in a MEDIM automatic processor. The 5 μm serial sections were examined and photographed by light and polarization light microscopes by hematoxilin-eosin, picrosirius, Prussian-blue and van Gieson staining and in native deparaffined specimens.

Results

1. Laboratory analysis produced negative results. No helminth egg could be isolated by flotation or by sedimentation processes. Quajacole-test was unable to identify blood-traces in the material found in the pelvis.

2. Histological analysis results of organs (kidneys, liver, lung, diaphragm, etc.) devoid of interest for our theme are disregarded here. Mucosa of the small bowel was not possible to recognize but the other layers of the intestinal wall were discernible. Several brownish configurations of various shapes and sizes were visible sticking to the intestinal surface. The majority of these were undigested or undigestible vegetable remains, amylaceous granules and vegetable-fibre. In slightly double-breaking shells there were egg-shaped, 45–60 x 40–50 μm sized, on their edges shiny configurations among them: helminth ova. They were granular or homogeneous inside (Fig. 1). Some robust and mild birefractive hooklets were visible (Fig. 2). We managed to find the worm remain as well. It was several centimetres long. It had thick cuticle and symmetrically located subcuticular thickenings on both sides (Fig. 3). The intestinal tract had a complicated,

branching structure (Fig. 4). A section of the worm was coiled round or it had a wavy pattern.

The histological images made it certain that we found intestinal parasites and their eggs. The lack of segmentation and the small number of robust hooklets as well as the internal structure of the worm made it certain that this parasite belonged to nematodes. Its size, shape, structure and size of ova indicate *Ascaris lumbricoides* as the most probable (Bálint 1962, Kenney 1973, Várnai 1973).

Discussion

Human protozoal infestations are proven facts at least for the last 15.000 years, but some data also indicated intestinal parasites in the coproliths of prehistoric hyena of the Lower-Pleistocene (Ferreira et al. 1993). It seemed to be probable that fozzilized *Homo sapiens* and perhaps even the Neanderthals did suffer from intestinal parasite diseases.

Helminthic diseases must have caused a lot of problems. in his book on pharmaceuticals written in the 5th century, the Greek Lucius Apuleus suggested to use *santin*, a disgusting mixture of excrements, worms, etc. This material had been used to deworm people for almost 1500 years (Hints 1939). In he 6th century, Alexandros devoted an extra volume to helminthic diseases. Avicenna suggested to take mercury and its compaunds to deworm in the 11th century.

Helminthiasis is common in tropic and subtropic regions while it is somewhat less frequent in temperate and cold zones (Reinhard et al. 1988). It occurred in the Old as well as in the New World. It was identified in regions with advanced animal-breeding in the largest numbers, but it was not rare in regions where animal-breeding never started (Wells 1984–85). *Trichuris trichiura* was an autochtonous parasite in Central Europe (Aspöck et al. 1995).

It could have been the most common in Transylvania within historic Hungary (the recent population of Transylvania is still 30–40% infested with intestinal parasites). Not only nematodes (*Enterobius vermicularis* and *Ascaris lumbricoides*) but cestodes *(Taeniae)* also featured in historical literature (Pápai-Páriz 1690, new ed. 1978, Apáczai-Csere 1700, new ed. 1980, Pettyéni Borbély 1683, new ed. 1983).

As far as we know no helminthiasis was discovered until now by palaeopathologial analysis in Hungary. One of the reasons for it could be the relatively small number of mummies preserved in the country (except for the mummies uncovered in Vác). Palaeopathological analysis was carried out only on a minority of these (Józsa et al. 1995, Susa and Józsa 1995). Another possible explanation is that the archeologists executing the excavations are not aware of the possibilities of palaeopathological analysis and they do not collect soil-samples from the pelvis regions of graves and from the trash- and dung-pits uncovered.

The Conquering and Árpád-period Hungarians kept a large number of animals from a large number of species (horse, cattle, sheep, goat, pig, camel, donkey, buffalo, fowls, dog, cat, etc.). Lots of them must have been hosts or transmitters of several parasites, and we are justified to take it for granted that humans must have also been infested (Józsa 1996). Written sources of the 16th and 17th centuries indicated a considerable commonality of intestinal parasites as well.

Fig. 1: Egg-shaped, 45–60 x 40–50 μm sized configurations (helminth eggs) are visible in the contents of the small bowels, 100 x.

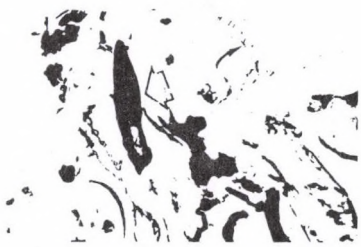

Fig. 2: The rostellum (arrow) of the mouth region of the worm is visible. Next to it undigested vegetable remains (curved arrow) can be observed. Picrosirius staining, 200 x.

Fig. 3: Thickenings (arrow) are visible on the intestinal surface of cuticula. Picrosirius staining, 200 x.

Fig. 4: Contours of the worm fragment found in the intestinal lumen. B: intestinal wall, T: contents of bowels, F: worm. Hematoxilin-eosin staining, 100 x.

We know that of our examined man, Antal Simon lived in a closed community of children (he was the director of the Institute of Deafs). It made him an easy victim of infestation as nemathelminths spread directly from man to man.

In recent years the detailed histological analysis of the mummified specimens of various ages and of varied social status were carried out by us. Helminthiasis was found only in the case described above. As far as we know it is the first time that helminthiasis of Hungarian historical material was published.

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