Southampton French Quarter 1382 Specialist Report Download E6: Intestinal Parasites

By Andrew K. G. Jones

Thirty-one earth samples from excavations at Southampton French Quarter (SOU1382) were examined for intestinal parasite ova. Eggs of two nematodes were identified in 7 samples. Ova with two polar openings were identified to the genus *Trichuris* and larger ova with characteristically mammilated outer shell were attributed to the genus *Ascaris,* an intestinal roundworm. Measurements of trichurid ova were taken, the size of the overall eggs and their association with *Ascaris* ova indicate that the species present is *Trichuris trichiura*, the human whipworm.

Introduction

The presence of ancient human faecal material on archaeological sites can be deduced by recovering eggs of intestinal parasites in well stratified earth samples. The presence of *Ascaris* and *Trichuris* ova in deposits when associated with food plant macrofossils (notably fruit seeds and cereal remains) is now considered to be a key indicator for the presence of human and other faeces in archaeological deposits (Kenward and Hall, 1995). Ova of *Trichuris* and *Ascaris* are highly recognisable microfossils and are usually present in large number – up to 60,000 ova per gram in some anoxic deposits – and can provide an early indication of the presence of human faeces (Reinhard and Bryant 1992, Jones 1982). Eggs of these two worms are sufficiently diagnostic to allow generic identification based on morphological features following microscopic examination (Thienpont et al. 1986).

The samples varied considerably in both colour and texture. Sixteen samples consisted of concreted material collected from sieved samples. Most appeared in the hand to be aggregations of inorganic soil particles bound together in an inorganic matrix. A few resembled coprolites and on closer inspection contained inclusions, notably small splinters of large mammal bones, indicating they were dog droppings. The remaining soil/earth samples also varied, ranging from dark grey brown clay with low organic content, to friable very dark grey organic silt. Brief details of each sample are provided in Tables 1-3.

Methods and materials

The practical work for this project was carried out in two phases. In the first assessment phase concreted samples were disaggregated in 10 ml of 1M hydrochloric acid. After approximately two weeks digestion in acid, and with the aid of gentle disaggregation using a freshly cleaned glass rod, the samples were decanted through a freshly washed 250 micron aperture stainless steel sieve. Few of the samples had completely disaggregated, but all produced a suspension of mineral and other particles. Aliquots (approximately 0.15 ml) of the filtered suspension were pipetted onto a standard microscope slide, mixed with 2 or 3 drops of warmed glycerine jelly and covered with a coverslip. The slides were scanned at a magnification of 100 using a high-powered transmission microscope. The results of this investigation are summarised in Table 1.

Also in the assessment phase of this project, fifteen unconsolidated earth samples mostly taken from pits considered to contain likely to contain human cess were processed following the procedure outlined by

Dainton (1992). This was designed for the rapid assessment of samples. It should be noted that this is the first time the present author has used this technique. Brief observations of the samples and the results are provided in Table 2.

In the final phase of work (Table 3), 3 gram sub-samples of the 15 earth samples were disaggregated in 42 ml of deionised water and processed following the modified Stoll procedure as recommended by the Ministry of Agriculture, Fisheries Food Agricultural Development and Advisory Service (1977).

Slides were examined and parasite ova measured using an Olympus BX51 transmission microscope with an Olympus DP70 camera linked to a personal computer running the image processing programme Soft Imaging System analySIS. Measurements of trichurid ova were taken following Beer (1976).

Results

The concreted samples, although most unpromising at first sight, produced more samples with parasite ova than the earth samples. In all 8 of the 16 produced recognisable parasite ova. While one sample produced a single ovum (context 3167) the presence of 10 ova in context 6574 is convincing evidence for the presence of significant amounts of faeces, probably of human origin.

Despite an relatively high organic content of some of the earth samples, most failed to produce cellular structures on microscopic examination. Nearly all samples, however, did contain brown particles, which might best be described as ‘amorphous organic particles’. Nearly all samples contained small charcoal fragments.

Only five of the earth samples (contexts 3168, 3736, 7173, 7573, 7576) produced parasite ova. Of these of the samples only contexts 3168 and 3736 produced more than a single ovum.

All of samples were dominated by small mineral particles, mostly angular, transparent clasts, probably quartz grains. Relatively few other diagnostic microfossils were observed.

The mean width of trichurid ova was 26.2 microns and the standard length (length minus polar plugs) was 48.5 microns.

Discussion

The identification of parasite eggs from archaeological deposits has recently been reviewed and discussed by Dark (2004). Precise identification depends on accurate measurements of both modern and well documented archaeological finds. The measurements of a sample of the Southampton trichurid ova were compared with modern data provided by Beer 1976 and Elmehaisai (1987). The latter analysed measurements of ova from 6 modern species of *Trichuris* taken from cattle, sheep, dogs, mice, pigs and human trichurid ova recovered from the Iron Age body of Lindow Man. Elmehaisi gives that the mean width of the human whipworm ova to be 26.1 microns (3.6 microns smaller than its closest relative *T. muris.* The Southampton eggs produced a mean width of 26.2 microns (0.1 microns larger than that given for Lindow Man). Taken alone the width measurement is very convincing evidence for the Southampton eggs being from the human whipworm *T. trichiura.*

The mean measurements for the standard length (length minus polar plugs) of 48.5 microns also is closest to those for the human species, but here the Southampton ova are on average 2.9 microns smaller than those from Lindow Man. The other five species produced ova with far larger mean standard length ranges: 54.3 microns (*T. globulosa*) to 74.8 microns (*T. vulpis*).

Together the measurements provide convincing evidence that the trichurid ova from Southampton are from the human parasite, *Trichuris trichiura* and their presence in samples indicates the presence of human faeces, albeit poorly preserved.

The texture of all the samples examined contrasted strongly with samples of organic material from excavations in York (Kenward and Hall 1995). The Southampton material is in general contains relatively small amounts of organic material when examined macroscopically. Nevertheless, the results of this assessment and analysis clearly demonstrate that the samples, both concretions and unconsolidated earth samples do contain parasite ova and most contained amorphous organic particles lacking cellular structure.

The rapid method for scanning earth samples allowed for more rapid processing of samples than the 'modified Stoll technique' used for most of the York samples. (For details see Kenward and Hall (1995) and references therein.)

It is clear from comparing Tables 2 and 3 that the some of the samples that had given a negative results in the assessment phase of investigation provided positive results when larger amounts of sediment were considered in the analysis phase. However, there are also cases where the analysis phase proved to be negative, contradicting the results of the assessment. This is presumably a consequence of the low numbers of ova per gram of sediment, and their poor preservation.

Conclusion

Measurements taken on ancient trichurid ova from the Southampton samples (see Table 4) provide good evidence that the worms responsible for the eggs were the human whipworm, *Trichuris trichiura*.

Parasite eggs were found in 50% of the samples of concretions and approximately 25% of the earth samples, and were present in pit fills from all phases represented at the site. Those samples with large numbers of eggs are highly likely to be taken from cesspits. Those with small numbers of ova may also be from cesspits, but here the concentrations of ova and the state of organic particles suggest that there has been much biological decay of the organic matter. It is also possible that significant amounts of non-faecal matter has contributed to these deposits, effectively masking the human ordure, a conclusion in keeping with the recovery of general food and other domestic waste from these features.

In a few cases these conclusions are consistent with the botanical analysis (Smith, this volume) which demonstrates the presence of food plants commonly ingested by humans in the same samples, for example sample 155 from a Late Medieval cess pit fill (context 6148) and sample 148 from a Post medieval cess pit fill (context 3168).

Two coprolites are thought to be of canine origin on the basis of their morphology and presence of splinters of mammal bone found within each. Neither produced parasite ova.

The results presented in this report indicate that faecal material almost certainly of human origin, as well as dog faeces are present at the site.

It is also worthy of note that the methodology used in this analysis phase did not significantly add to the results of the more rapid assessment work, further justifying the widespread adoption of the relatively rapid scanning method as given by Dainton (1992). This technique clearly identified the presence of parasite ova in some earth samples and is ideal for assessments. It must be remembered that only a minute amount of sediment is examined (2ml sphere of whole sediment). It is also important to remember that the 'Dainton method' is not appropriate when investigating concreted material.

Tables

Table 1. Samples of coprolite and other concretions from Southampton French Quarter (SOU1382) in the assessment phase.

Sample Number	Context Number	Description	Weight examined	Results
193	8091 Anglo-Norman surface	Amorphous concretion, variable colour.	3.0g	Pollen grains, cellular material, amorphous organic particles. No parasite ova observed.
175	7456 High Medieval Pit fill	Large yellowish concretion with ?iron core.	3.0g	Amorphous organic particles. Two *Trichuris* ova.
161	7173 Late Saxon pit	Dark grey amorphous concretion.	1.0g	Amorphous organic particles, micro charcoal. *Ascaris* and *Trichuris* ova.
174	7414 Anglo-Norman Pit fill	Greenish grey amorphous concretions.	3.0g	Amorphous organic particles, charcoal. No parasite ova.
147	4616 Anglo-Norman well fill	Greenish grey amorphous concretions.	3.0g	Many inorganic silica particles, little amorphous organic material.Two *Trichuris* ova.
171	7574 Anglo-Norman cess pit fill	Light-mid brown amorphous concretion.	3.0g	Many amorphous organic particles, a few phytoliths. *Ascaris* and *Trichuris* ova present.
	7751 Late Medieval pit fill	Dark grey-brown amorphous concretion.	2.0g	Abundant amorphous organic particles. *Ascaris* and *Trichuris* ova present.
146	4575 Anglo-Norman well fill	Greenish grey mineral concretions.	3.0g	Few amorphous organic particles. No parasite ova observed.
	6203 Post medieval pit fill	Dark grey amorphous concretion with chalk fragments.	2.7g	Many silica particles, little amorphous organic material. No parasite ova observed.
56	5058 Late Medieval pit fill	Light to mid grey brown amorphous concretion.	3.0g	Few amorphous organic particles. No parasite ova observed.
	8478 Late medieval pit fill	Coprolite 25.2 mm diameter with bone fragments. Probably canine coprolite.	6.4g	Many silica particles. No parasite ova observed.
	7076 Late medieval pit fill	Amorphous mineral concretion, glass-like texture on fresh breaks.	3.3g	Few amorphous organic particles. No parasite ova observed.
	4335 High medieval layer	Coprolite 17.8 mm diameter with bone fragments Probably canine coprolite.	4.7g	Few amorphous organic particles. No parasite ova observed.
166	7335 Anglo-Norman pit fill	Mid-dark greenish brown amorphous concretion.	3.0g	Many amorphous organic particles. Two *Trichuris* ova.
	6574 Late medieval pit fill	Grey brown amorphous concretion.	1.3g	Many amorphous organic particles, fine charcoal. Six *Trichuris* and four *Ascaris* ova.
	3167 Post medieval cess pit fill	Amorphous concretion with white mineral.	5.2g	Few amorphous organic particles. One *Trichuris* ovum.

Table 2. Samples unconsolidated earth and soil from Southampton French Quarter (SOU1382) in the assessment phase.

Sample Number	Context Number	Description	Volume examined	Results
177	7577 Anglo-Norman cess pit fill	Dark grey brown clay.	2 mm sphere	Few organic particles. No parasite ova observed.
181	7581 Anglo-Norman cess pit fill	Mid grey brown sandy loam.	2mm sphere	Few organic particles. No parasite ova observed.
170	7575 Anglo-Norman cess pit fill	Mid grey brown shelly clay loam.	2mm sphere	Large charcoal fragements. Many?shell fibres, a few unidentified cysts. Some amorphous organic particles. No parasite ova observed.
167	7336 Anglo-Norman pit fill	Mid grey shelly clay loam.	2mm sphere	Some charcoal. Some amorphous organic particles. No parasite ova observed.
56	5058 Late Medieval pit fill	Mid grey brown clay.	2mm sphere	Some charcoal. Some amorphous organic particles. No parasite ova observed.
113	3736 Anglo-Norman pit fill	Dark grey brown organic silt.	2mm sphere	Much amorphous organic material. Ten *Trichuris* ova
136	4405 High medieval deposit	Light gingery brown clay.	2mm sphere	Much amorphous organic material. No parasite ova observed.
180	7580 Anglo-Norman cess pit fill	Dark grey brown clay loam.	2mm sphere	No cellular material. Charcoal fragments. No parasite ova observed.
155	6148 Late medieval cess pit fill	Mid grey brown clay loam.	2mm sphere	Little cellular material. No parasite ova observed.
178	7578 Anglo-Norman cess pit fill	Dark grey brown clay loam.	2mm sphere	Charcoal fragments. No parasite ova observed.
161	7173 Late Saxon pit fill	Mid grey brown silty organic clay.	2mm sphere	Few amorphous organic particles. Two thin walled *Trichuris* ova.
172	7573 Anglo-Norman cess pit fill	Dark grey brown silty organic detritus.	2mmsphere	Charcoal fragments. One possible decorticated *Ascaris* ovum.
176	7576 Anglo-Norman cess pit fill	Dark grey brown clay.	2mm sphere	Little cellular material. One fungal spore. One possible *Trichuris* ovum.
193	8091 Anglo-Norman surface	Mid grey brown sandy silt.	2mlm sphere	Charcoal fragments. No parasite ova observed.
148	3168 Post-medieval cess pit fill	Mid grey brown clay.	2mm sphere	Charcoal fragments. No parasite ova observed.

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Table 3. Samples unconsolidated earth and soil from Southampton French Quarter (SOU1382) in the analysis phase.

Sample Number	Context Number	Description	Weight examined	Results
177	7577 Anglo-Norman cess pit fill	Dark grey brown clay.	3 g	Mostly inorganic soil particles. No parasite ova observed.
181	7581 Anglo-Norman cess pit fill	Mid grey brown sandy loam.	3 g	Dark grey brown suspension, few charcoal gfragmetns some amporphous organic particles. No parasite ova observed.
170	7575 Anglo-Norman cess pit fill	Mid grey brown shelly clay loam.	3 g	Mostly mineral fragments. Some amorphous organic particles. No parasite ova observed.
167	7336 Anglo-Norman pit fill	Mid grey shelly clay loam.	3 g	Some charcoal. Some amorphous organic particles. One ? decorticated *Ascaris* ovum.
56	5058 Late medieval pit fill	Mid grey brown clay.	3 g	Some charcoal. Some amorphous organic particles. No parasite ova observed.
113	3736 Anglo-Norman pit fill	Dark grey brown organic silt.	3 g	Much amorphous organic material. A few phytoliths. Nine *Trichuris* ova
136	4405 High medieval deposit	Light gingery brown clay.	3 g	Some amorphous organic material. No parasite ova observed.
180	7580 Anglo-Norman cess pit fill	Dark grey brown clay loam.	3 g	Dark grey brown suspension, few charcoal fragments, one ? fern spore. No other cellular material. No parasite ova observed.
155	6148 Late medieval cess pit fill	Mid grey brown clay loam.	3 g	One fungal spore. One *Trichuris* ova observed.
178	7578 Anglo-Norman cess pit fill	Dark grey brown clay loam.	3 g	Much mineral material, some charcoal fragments. Some amporphous organic material. No parasite ova observed.
161	7173 Late Saxon pit fill	Mid grey brown silty organic clay.	3 g	Few amorphous organic particles. No parasite ova observed.
172	7573 Anglo-Norman cess pit fill	Dark grey brown silty organic detritus.	3 g	Few cellular fragments, Charcoal fragments. No parasite ova observed.
176	7576 Anglo-Norman cess pit fill	Dark grey brown clay.	3 g	Little cellular material. One fungal spore. One possible decorticated *Ascaris* ovum.
193	8091 Anglo-Norman surface	Mid grey brown sandy silt.	3 g	Suspension very dark grey brown, few charcoal fragments. No parasite ova observed.
148	3168 Post-medieval cess pit fill	Mid grey brown clay.	3 g	Few fragments. Five *Trichuris* ova 2 *Ascaris* ova and 6 ? decorticated *Ascaris* ova.

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Table 4. Measurements of trichurid ova

Sample and Context Number	Length minus polar plugs in microns	Width in microns
113 3736	50	26
113 3736	49	27
1 13 3736	48	25
113 3736	49	26
113 3736	49	25
113 3736	48	27
113 3736	47	26
113 3736	48	25
113 3736	48	31
155 6148	49	24
Mean	**48.5**	**26.2**

Figures

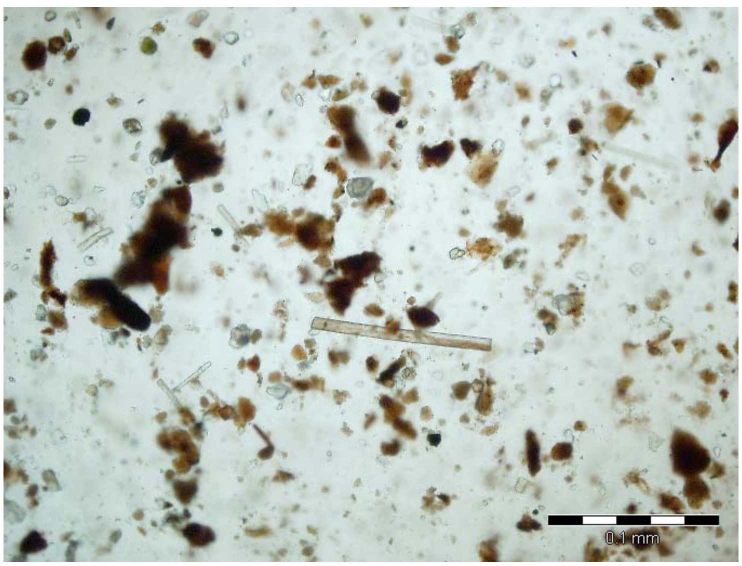

Figure 1. Overview of slide which produced an assemblage of parasite ova. It shows the presence of a ?rod-form phytolith, charcoal fragments, amorphous organic particles and mineral particles. Southampton SOU 1382. Sample 113. Context 3736.

Figure 2. Thin walled trichurid ovum lacking polar plugs from Southampton SOU1382 Sample 113 Context 3736.

Figure 3. Thick walled trichurid ovum from Southampton. SOU1382 Sample 113 Context 3736.

Figure 4. Possible parasite ovum, ?decorticated *Ascaris lumbricoides* from Southampton SOU1382 Sample 167 Context 7336.

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