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PARASITOLOGICAL INVESTIGATIONS ON SOIL SAMPLES, COPROLITES AND FAECAL CONCRETIONS FROM THE TANNERS ROW SITE, PONTEFRACT.

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Summary

Small numbers of samples of soil, coprolite and concretions of unknown origin were examined for the presence of eggs of intestinal parasites and microfossils. Four contained sufficiently large numbers of eggs of nematodes which infest the human digestive tract to indicate that the sampled features were latrine pits. The coprolites are considered most likely to be of canine origin on the basis of their size and the nature of bone inclusions.

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Introduction

A group of ten samples collected from a series of medieval pits at Tanners Row, Pontefract, were submitted to the Environmental Archaeology Unit, University of York, for detailed parasitological examination in order to determine if human faeces was a component of the pit fills.

Methods and materials

TABLE 01

List of material sent to the E.A.U. for parasite analysis

SAMPLE	CONTEXT	TYPE OF SAMPLE	AMOUNT EXAMINED
1	503C	fragments of concretion from bulk sample	6g
2	503C	soil for analysis	6g
3	250	fragments of concretion from bulk sample	6g
4	250	soil for analysis	6g
6	98	coprolite fragment from bulk sample	2g
37a	211D	coprolite fragments from bulk sample	3g
37b	211D	fragments of concretion from bulk sample	6g
41	98	soil for analysis	6g
43	211D	soil for analysis	6g
45	41	soil for analysis	6g

Following a procedure outlined by the Ministry of Agriculture, Fisheries and Food (1977 p 3) for examining modern faecal samples, a 6g subsample from each of the five of the unconsolidated samples was placed in a 120 ml jar with 42 ml of sodium pyrophosphate solution. The jar was then shaken and left for 2-4 days then a further 42 ml of water was added. In order to ensure that each sample was completely disaggregated, they were whisked using a mixer emulsifier and given 5 short bursts of approximately 5 seconds each. The remaining samples of coprolites and concretions were treated in similar way but hydrochloric acid (1M HCl) was substituted for the sodium pyrophosphate and water. These samples were left to disaggregate for a period of up to one week. The resulting suspension was then poured through a freshly flamed 250 micron sieve to remove coarse particles, and 0.15 ml aliquots of the filtrate mounted in glycerine jelly using 22 X 50 mm coverslips. Slides were scanned at X 120 using a transmission microscope and all ova were counted. Where possible, at least ten ova per sample were measured using a eyepiece graticule calibrated to a stage micrometer. Recent experiments have shown that although parasite ova can withstand the rigours of pollen analysis, the size of the eggs can be modified by the process (Hall, Jones and Kenward, 1983). Accurate identification is therefore only possible if samples are carefully prepared using reagents which do not affect egg size.

Results

In four of the deposits two kinds of ova were observed. One, a barrel-shaped structure sometimes possessing two polar plugs, was typical of whipworms - the genus Trichuris. Whipworms are parasitic nematodes which infest the lower intestine and caecum of many mammals throughout the world. Eggs are produced in large numbers and shed into the gut lumen and passed with faeces. Light infestations usually cause little harm to the host, while heavy worm burden can cause prolapse of the rectum, diarrhoea and blood in the faeces.

The condition of the Trichuris ova was assessed by considering the numbers which fall into the following categories:

1) complete, i.e. possessing two polar plugs;
2) damaged, i.e. the shell is complete but the condition of either one or both plugs suggest that the ova are beginning to disintegrate;
3) shell complete lacking any trace of a polar plug;
4) shell broken or crumpled.

The other kind of egg present in the pit fills possessed a mammillated outer shell characteristic of the large roundworm - genus Ascaris, a common parasite of pigs and man. This nematode can grow to 30 cm and like the whipworm, produces large numbers of eggs which are passed with faeces. The larvae, which hatch from ingested embryonated eggs, migrate through the host tissues and can cause considerable damage. Nevertheless, many people harbouring small numbers of worms do not suffer severe symptoms.

Ascaris ova were classified as either complete, broken or decorticated. No other parasite ova were positively identified, although structures closely ressembling the protozoan oocysts of *Eimeria* or *Isospora* were observed in sample 4. In addition the cysts of a number of testate amoebae were present in samples 4, 41 and 45.

Both *Ascaris* and *Trichuris* eggs have been widely reported from archaeological deposits in Britain and mainland Europe including the Danish bog burials (Jones, 1982) and Lindow Man, a bog burial from Cheshire (Jones, 1986). Most published records either assume the ova to have been passed by man or argue that the *Trichuris* ova are from the human whipworm *Trichuris trichiura* because the number of *Trichuris* ova exceeds those of *Ascaris*. Some accounts provide more convincing evidence by presenting details of the ancient egg dimensions and comparing these with data from a range of modern reference specimens.

Table 02 gives the egg-counts and the the egg-count data converted to concentration of ova per gram of deposit. It is clear that *Trichuris* ova were far more abundant than *Ascaris* ova for all samples and that parasite ova were not present thoughout the pit fills.

TABLE 02

Counts of Trichuris and Ascaris ova from samples collected at Tanners Row, Pontefract.

Trichuris

Sample		Context	No T+2	No Te	No T-p	No Tfg	Total
1	c	503C	0	3	11	1	15
2	s	503C	0	3	107	14	123
3	c	250	3	10	38	2	53
4	s	250	0	2	201	5	208
6	cp	98	0	0	0	0	0
37a	cp	211D	0	0	0	0	0
37b	c	211D	0	0	0	0	0
41	s	98	0	0	1	0	1
43	s	211D	0	0	0	0	0
45	s	41	0	0	0	0	0

Ova per gram = Totals x 100.

T+2 = Trichuris ova with two complete polar plugs.

Te = Trichuris ova with eroded polar plugs.

T-p = Trichuris ova with no polar plugs.

T fg = fragmentary and crumpled Trichuris ova.

s = soil; c = concretion; cp = coprolite.

Ascaris

Sample		Context		Af	Au	Afg	Total
1	c	503C		15	0	2	17
2	s	503C		52	2	32	86
3	c	250		44	0	2	46
4	s	250	*[a]	89	3	3	95
6	cp	98		0	0	0	0
37a	cp	211D		0	0	0	0
37b	c	211D		0	0	0	0
41	s	98	*	0	0	0	0
43	s	211D		0	0	0	0
45	s	41	*	0	0	0	0

Ova per gram = Totals x 100

Af = fertilized Ascaris ova; Au = unfertilized Ascaris ova; Afg = fragments of Ascaris ova.

* = Sample contained cysts of testate amoebae.

[a] = Sample contained oocysts of Eimeria or Isospora.

Table 03 shows the egg dimensions of the Trichuris ova for all samples combined. When this data is compared to that given by Beer (1976), it leaves little doubt that the majority of the Trichuris ova were from the human whipworm T. trichiura. A small number of wide Trichuris ova (three, with a width of up to 32.4 microns) were found. These wide eggs are probably abberant T. trichiura eggs. Unusually wide eggs are produced by T. trichiura (Burrows, 1965 p 176 illustrates one) and some wide T. trichiura eggs were found in Lindow Man (Jones, 1986). However, it is just possible that they are from a non-human species, perhaps _T. muris_ the whipworm of rats and mice or _T. suis_, the pig whipworm.

Unfortunately, the ova of _A. lumbricoides_ and _A. suum_, the large roundworms of man and pigs respectively, produce ova of identical size. There are only two hosts indigenous to north-west Europe which can harbour _Trichuris_ and _Ascaris_, man and pig. However, because they were associated with large numbers of _Trichuris trichiura_ ova, the _Ascaris_ ova are assumed to be _A. lumbricoides_.

Four samples yielded between 3,200 and 30,700 trichurid ova per gram and can be described as 'almost certainly faecal but may be contaminated with other materials' Jones (1985). One sample contained 100 ova per gram. The others contained no ova. Almost all the samples contained large numbers of insect fragments, pollen and fungal spores.

There can be little doubt that the pits contained large amounts of human faeces in layers 503C and 250. The two coprolites, samples 6 and 37a, contained small fragments of large mammal bones which appear to have been chewed and eaten by dogs. Sample 37b was not definitely identified as human faecal concretion, but did contain a lot of organic material.

TABLE 03

Dimensions of <u>Trichuris</u> and <u>Ascaris</u> ova from layers 503c and 250 collected from pits at Tanner Row, Pontefract.

<u>Trichuris</u>

Sample	Width	Total length	Length minus polar plugs
Maximum	32.4	57.6	54.0
Minimum	21.6	50.4	46.8
Mean	25.8	54.0	49.0
SEM	0.28	-	0.38
n	40	3	40

<u>Ascaris</u>

Sample	Width	Length
Maximum	70.2	97.2
Minimum	46.8	61.2
Mean	54.7	73.1
SEM	0.95	1.40
n	32	32

All measurements in microns

SEM = Standard error of the mean

n = number of observations

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