An Examination of Biological Materials from Coprolites from XVIII Dynasty Amarna, Egypt

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Well-preserved animal coprolites were recovered from the Workmen’s Village, associated with the construction of the tombs of the XVIII Dynasty at Amarna in Egypt during the mid-14th century BC. The purely archaeological evidence has been interpreted as indicating the source of the dung as pigs, which was supported by study of endoparasite remains. Careful dissection of the excreta produced a small insect fauna, which included the small eyed flour beetle, Polorus ratzeburgi, the earliest fossil record. Further evidence of the diet of the animals was recovered.

Keywords: COPROLITES, DIET, COLEOPTERA, TUT'ANKHAMUN, AMARNA.

Introduction

There has been little previous work upon insect remains from sites in Egypt, where the dry conditions of the desert and desert fringe, provide ideal preservation conditions. Faunas associated with offerings in tombs have been examined by Alluaud (1908), Alfieri (1931), Burleigh & Southgate (1978), and Chaddick & Leek (1972); Levinson & Levinson (1985) provide a useful overview of this material. Whilst samples from a Roman site, Mons Claudianus in the Eastern Desert, have recently been published (Panagiotakopulu & van der Veen, 1997), this study represents the first attempt to apply palaeoentomological methods to a Pharaonic occupation site in Egypt. Alfieri’s (1931) material came from the tomb of Tut’ankhamun, and the material examined here, also from Amarna, similarly dates to the second part of the 14th century BC. Coprolites from archaeological sites have the potential to provide detailed information about the diet, levels of hygiene, the surrounding environment and the species of animal related to the excrement (e.g., Baker & Brothwell, 1980; Hall, Jones & Kenward, 1983; Bouchet & Paicheler, 1995).

The Site

The so-called Workmen’s Village consists of a group of well-preserved structures apparently built to house the workers involved in the construction of the tombs of the XVIII Dynasty. The site lies at a distance of about 1·2 km from the main city of el-Amarna, on the floor of one branch of a shallow Y-shaped valley in a low plateau which runs out from the foot of the cliffs that surrounded Amarna. The most favoured explanation about the role of the site is that it housed workers and artists employed in the cutting and decorating of the rock-cut tombs, but the possible involvement specifically of this settlement in the building of the tomb of Akhenaton is complicated by the existence of a second, still unexcavated village a kilometre to the east (Kemp, 1984). Since the pottery from the site is overall homogeneous, and nothing was found in the village mentioning the name of a king later than Tut’ankhamun, it is likely to have been occupied for 20–25 years, starting with regnal year 4 of Akhenaten and continuing through the short reigns of Smenkhare and Tut’ankhamun (c. 1350–1323 BC) (Kemp, 1984).

During excavation, a part of the Workmen’s village was interpreted as animal pens (Shaw, 1984), and coprolites from the area were examined in an attempt to find out the species of animal kept. Donald (1984) carried out parasitological analysis and found eggs of Ascaris spp., either A. suum or A. lubricoides, a worm that infests both humans and pigs, and Taenia spp., the tapeworm whose hosts include man, and a wide range of domesticated and wild animals (Noble & Noble, 1976). The coprolites, which yielded Taenia spp. were amorphous lumps and fragments, whilst those that produced Ascaris spp. were well formed, and, despite the variation in form, the excavator came to the conclusion that the pens were for stalling pigs (Shaw, 1984). A botanical report on coprolites from the 1980–1981 excavations has shown that the animals in question were being fed on food which included unthreshed emmer wheat spikelets, barley, rye grass and sedges (Renfrew, 1985). Study of additional coprolite samples from the putative sties, using a range of other
techniques, particularly examining the insect remains, provided an opportunity to evaluate not only the original hypothesis, but also to test whether excrement could be sourced to species on evidence other than endoparasites.

The Samples
The material examined forms part of an extensive palaeoecological sampling strategy for Amarna (Kemp, Samuels & Luff, 1994). Samples were recovered during excavation directly into polythene bags and sealed to avoid contamination. These were stored initially on site, but later shipped to London for further study. The coprolite samples consisted of amorphous lumps of greyish-brown (Munsell Color 10YR 5/2) and reddish-brown (Munsell Color 5YR 5/4 (1992)) material with evident plant remains (Figure 1(a), (b)). Six of the samples were carefully dissected, and examined under low power magnification with a stereomicroscope. All identifiable material was recorded (Table 1), and included plant fragments, hair, mammal bones and insects.

The Results
The botanical remains recovered were of varied preservation and included desiccated, slightly burnt and completely charred plant debris consisting mainly of emmer, *Triticum dicoccum*, spikelets and in some cases seeds, barley, *Hordeum vulgare*, and rye grass, *Lolium* sp. The picture given by the plant remains is very similar to the one described by Renfrew (1985). It would appear that the animals associated with the faeces were fed on cereal waste. The charred fragments may also suggest that in some cases bread waste was also used.
A few insects were also recovered in the coprolites (Table 2). *Sitophilus granarius* (L.), the grain weevil, one of the most serious pests in granaries at the present day, was found in one sample. *Sitophilus granarius* is recorded from a wide range of crops including wheat, rye, barley, maize oats, buckwheat, millet, chickpeas and even chestnuts, acorns and cornmeal (Hoffman, 1954). It is usually found in stored cereal crops and has not been found breeding in the field, in contrast with the rice weevil, *S. oryzae* (L.). Despite the fact that it is flightless, it is one of the most important cosmopolitan pests, having long been transported by man together with food supplies (Buckland, 1990). The primary hosts of the weevil are likely to have been the wild progenitors of cultivated cereals, and it may have moved from the nests of rodents to the stores of man, even before the beginnings of agriculture (Buckland, 1981). Solomon (1965) recorded *S. granarius* from barley deposited in a tomb beneath the step pyramid at Saqqara, Thebes, dated to 2300 BC, and Helbaek (in Solomon, 1965) recorded further specimens of *Sitophilus* from another tomb of 600 years earlier. The earliest evidence from Europe comes from Neolithic Servia in Macedonia (Hubbard, 1979: 227) where the insect is imprinted in a piece of pottery, and it has also been recovered recently from a Bandkeramik site in Germany (Büchner & Wolf, 1997). *Sitophilus granarius* is also known from the Middle Bronze Age in Crete (Jones, 1984) and the Late Bronze Age settlement of Akrotiri on Santorini, Greece (Panagiotakopulu & Buckland, 1991).

*Palorus ratzeburgi* Wiss., the small eyed flour beetle, was recorded in two of the samples. This beetle is a pest in cereal products and other commodities, particularly in mouldy grain residues previously attacked by weevils (Brendell, 1975); Pals & Hakbijl (1992) suggest that it feeds principally on the faeces of *Sitophilus* spp. The finds in the Amarna coprolites are the earliest records of the pest. By the Roman period, the species appears to have become a widespread pest in the Western Roman Empire, and it has been recovered from 1st and 2nd century Roman deposits at Amiens (Yvinec, 1997), Laurium in the Netherlands (Pals & Hakbijl, 1992), London (de Moulins, 1990) and York (Kenward & Williams, 1979).

Other species found could not be identified to the generic level, but included the family Cryptophagidae, usually associated with damp and mouldy deposits, often stored product residues, and Tenebrionidae. This family includes stored product pests, but many species are associated with arid environments, and the unidentified fragment from the coprolite probably relates to the natural background fauna of the site. The beetles recorded from the samples, are closely associated with the plant remains, and point further to the deduction that part of the diet of the animals consisted of infested cereals. High pest infestation levels, however, can make grain inedible and in some cases, depending on increases in the microflora, toxic.

### Table 1. Amarna coprolites

<table>
<thead>
<tr>
<th>Coprolite samples</th>
<th>Plant remains</th>
<th>Animal fibre</th>
<th>Bones</th>
<th>Insect remains</th>
</tr>
</thead>
<tbody>
<tr>
<td>TA85WV CH541 1914.1</td>
<td>Large amount of plant remains (emmer wheat spikelets + rye grass)</td>
<td>Hair (?pig)</td>
<td>Small mammal bones</td>
<td>Indet. fragments of Dipterus puparia, <em>Palorus ratzeburgi</em> Wiss. (right elytron)</td>
</tr>
<tr>
<td>TA85WV Ch541 1914</td>
<td>Rye grass and emmer wheat spikelets</td>
<td>Hair (?pig)</td>
<td>Small mammal bone</td>
<td><em>Palorus ratzeburgi</em> Wiss. (thorax) fragments of indet. Tenebrionid elytron Fragments and a whole Dipterus puparium</td>
</tr>
<tr>
<td>TA80WV L13, 3</td>
<td>Slightly burnt plant remains together with desiccated ones (rye grass)</td>
<td></td>
<td></td>
<td><em>Sitophilus granarius</em> (L.) (thorax) Cryptophagidae indet. (left elytron) Dipterus puparia fragments</td>
</tr>
<tr>
<td>TA80WV P26 Nfac8</td>
<td>Charred emmer spikelets and seeds of emmer and barley and uncharred glumes and chaff</td>
<td></td>
<td></td>
<td>Coleoptera indet. fragment</td>
</tr>
<tr>
<td>10859 TA83WV R17 406</td>
<td>Desiccated plant remains (rye grass)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TA85.WV?P25 Eface 10</td>
<td>Desiccated plant material (rye grass+?flax seed)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 2. List of insects from Amarna

<table>
<thead>
<tr>
<th>List of insect species</th>
<th>Taxa</th>
<th>MNI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coleoptera</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cryptophagidae indet.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Tenebrionidae indet.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><em>Palorus ratzeburgi</em> Wiss.</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Curculionidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Sitophilus granarius</em> (L.)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Diptera</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Calliphoridae</em> puparia</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>puparia indet.</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Nebamun at Thebes (Davies, 1932: 57, figures 8 & 9).

Of pigs from the same period comes from the tomb of Ay. They were used as food for the lower classes.

Whilst it is apparent that in the New Kingdom pigs could have been ingested by the stalled animals. It is not improbable further pest of stored products, which cannot be certain. They are, however, most probably Calliphoridae, the maggots of which feed on carrion, indicating that meat or similar food residues were also fed to the animals.

A few small mammal bones were also recovered. Largely too fragmentary for identification or undiagnostic, their size range would suggest small rodents, a not improbable further pest of stored products, which could have been ingested by the stalled animals.

Conclusion

The insect fauna from the coprolites, consisting of animals accidentally ingested by the stock refines the interpretation available from purely botanical sources. The mix of animal and plant debris in the coprolites indicates stock able to process an omnivorous diet, and in this context, the most probable animal is the domestic pig.

Discussion

References and depictions of pigs and swine herding are very rare in Egypt, until the New Kingdom. During the XVIII Dynasty, 1500 pigs were owned by Renni, the mayor of al-Kab. 2000 pigs and piglets were owned by the temple of Amenhotep III at Memphis, and during the XIX Dynasty, 1500 pigs were owned by Renni, the mayor of al-Kab, 2000 pigs and piglets were owned by the temple of Seti I at Abydos (Houlihan, 1996: 28). The pig was associated with the god Seth, and considered a symbol of evil, as revealed in Spell 157, of the Middle Kingdom Coffin Texts (Houlihan, 1996: 29). Also in the late XVIII Dynasty Book of Gates, Seth took the form of a black pig (Houlihan, 1996: 29). A detail of the story is depicted in the sarcophagus chamber of the late XVIII Dynasty tomb of king Horenhab (Houlihan, 1996: 29). Another pictorial representation of pigs from the same period comes from the tomb of Nebamun at Thebes (Davies, 1932: 57, figures 8 & 9).

Whilst it is apparent that in the New Kingdom pigs were considered as impure, perhaps not appropriate food for the Egyptian upper class, the maintenance of the pig stalls in the Workmen’s Village implies that they were used as food for the lower classes.

Acknowledgements

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References


Davies, N. de G. (1932). The work of the graphic branch of the expedition. BMMA (Section II, March), 51–62.


