ACARI FOUND IN A MUMMY BUNDLE FROM THE CHILLON RIVER VALLEY, PERU

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Introduction

The study of organic remains contributes to the knowledge of ancient human populations and the environment where they lived (Araújo et al. 2003). The genus *Acarina* includes several species of ancient arthropods (mites and ticks) which appear in the fossil record as early as the Devonian Period (Krantz 1978). Some species of *Acarina* are vectors of infectious diseases affecting humans. Therefore, the finding of acari in ancient material contributes information concerning human-environment relationships, human practices, taphonomic processes, and the health of ancient human populations (Radovsky 1970, Kliks 1988, Hidaugo-Argüello et al. 2003, Guerra et al. 2003).

Although *Acarina* species are found worldwide, many of them have special environmental requirements. Therefore, the identification of some species in archaeological material helps to infer its provenance, contacts with specific fauna, flora, climate, etc. Acari are also associated with the consumption of organic debris, and so they colonize all materials containing organic remains. They are expected to be found on artifacts, food, clothes, and mummy bundles, preserved from the time of death or resulting from post-mortem invasion. Depending on the species of *Acarina*, they can represent preservation of past events or just museum microenvironments. The search for acari in mummified remains helps us to understand both present and past preservation, as well as the processes and provenience of the mummified body and other associated materials.

The first examination of surface samples performed on a bundle collected in the Chillon River Valley, Peru, now belonging to the collection of Museu Nacional, Rio de Janeiro, Brazil, was negative for ascarid specimens. The apparent absence of acari, which was interesting information for the curators, was explained by the intense natural salt (NaCl) impregnation of the bundle, which had been buried at the sandy plains of the valley. However, when other samples were collected after the bundle was opened, different acarid specimens were discovered. The goal of this paper is to call attention to this important source of information about environment and microscopic fauna related to archaeological samples.

Material

During an ethnographic mission to Peru in 1925, the Brazilian ethnographer A. C. Simões da Silva excavated an archaeological tomb in Aneon in the valley of the Chillon River close to Lima, Peru. That tomb was located on a farm called 'Marquez', the property of Ramon Geng, a Chinese immigrant to Peru (Silva 1930). Many bundles containing adult and child mummified bodies, associated with objects like gourds, weapons, pottery, food remains (maize, beans, peanuts, crabs), totora mats, hammocks, textiles, raw cotton, colored wool and cotton strings, silver needles, and shell necklaces, were recovered. The best preserved of those objects were brought to Silva's private collection. A bundle containing a young child was given to the Museu Nacional, in Rio de Janeiro. After Silva's death, his family donated part of his private collection to the Museu Nacional, and a second Chillon baby bundle was added to the Peruvian collection.

Almost 80 years later, curators located both bundles inside a box in the storage area of the Museu Nacional, in order to evaluate their preservation and treat them. Only one of the bundles was well preserved, so it was decided to open the partially destroyed one to study the wrappings and materials inside. No identification is available on which bundle was opened at this time, the one given by Silva in the twenties or the one donated by the family some decades later. The object consisted of a bundle (Figure 1A) enclosing the skeleton of a 4-6 month-old child (Ubelaker 1978). The wrappings were partially preserved around the middle part of the bundle. The two ends of the bundle were destroyed, the skull bones were crushed, and the textiles at the proximal end of the bundle were partially lost. The legs and feet were absent, probably destroyed together with the distal part of the bundle. Different layers of cotton and wool textiles comprised the wrappings. Raw cotton was used to cushion the face and upper chest of the child. The skeleton was extended, and retained most of its anatomical organization (Figure 1B). Hairs were found still adhering to some of the cranial vault bones, as well as to the textiles and cotton accompanying the bundle. Other materials were included in the pack such as an avocado nut, coca leaves, and small pieces of shell.

The tomb was described by Silva (1930) as a circular pit-hole, containing wrapped bodies of adults in sitting and extended positions, and child bodies associated with many burial goods such as pottery, personal artifacts for different purposes, and food in baskets or pots. Long tubes of cane (Ushnu) marked the place of each body in the tomb. Place and cultural context suggested that the bundles and the tomb belong to the Late Inca period. Intentional cranial deformation complicated by skull necrosis and infection was suggested to be the possible cause of death of this child (Souza et al. 2002).

Methods

Ten samples were collected from different places on the mummified body during the opening of the bundle and exposure of the skeleton, taken from inside the bundle between the wrappings and close to the human remains (Table 1). Standard techniques were used for the search of parasites, acari, insects, and microresidues in general. All samples were prepared according to paleoparasitological techniques (Reinhard et al. 1988, Araujo and Ferreira 1995). The samples were rehydrated in a 0.5% trisodium phosphate aqueous solution for 72 hours (Callen and Cameron 1960). For parasitological analysis, spontaneous sedimentation was used (Lutz 1919), and twenty slides of each sample were examined. The material was mounted on slides with glass covers and examined for the presence of parasites. Digital images were taken of all representative microscopic organic remains.

All the samples were negative for intestinal parasites, perhaps due to the age of the child at time of death. However, acari and other microresidues were found. Acari were examined in details and classified according to Krantz (1978). Results were associated to the archaeological context and compared to the literature.

Results and Discussion

Twenty-seven specimens of the Subclass Acari were recovered in the preparations. Four of them could not be classified into a suborder or family due to the poor preservation conditions (Figure 2B), but the other twenty-three could be classified (Table 2). Acari were found in eight of the 10 samples collected. Most of the acari found were in the inner part of the bundle, close to the skeleton and wrappings, in direct contact with the body.

Ten years ago, the first attempt to find acari in two samples collected on the surface of the bundle was performed. Negative results showed that no modern acari were active on the organic material. The complete absence of acari, whose species are found throughout the world associated with organic remains, could be explained as a possible consequence of the high ion-salt impregnation of the bundle.

The body came from a saline environment in the plains near Lima. Therefore, the continuous process of salt crystallization on the bundle surface, exposed to environmental changes for decades, may have contributed to prevent arthropod or other organisms preservation. However, the majority of the samples taken from inside the mummy showed acari fragments.

In the eight positive samples, several different kinds of acari were found. Tarsonemidae were the most commonly acari found (Figure 2A). They have different biological cycles and are found in a great variety of substrata and/or organisms such as plants, including those used as food. Their presence in the material is not specific, but might be associated to the Incas' essentially agricultural activity in the fertile soils where regular water distribution was assured (Favre 1974, Lehmann 1965). These acari could also be associated directly with the food found in the grave, the raw cotton fibers in contact with the body, the coca leaves, and other plant remains inside the bundle.

Acari of the suborder Oribatida were found (Figure 2C) in the soil, taking part in the decomposition of the dead. The Oribatida are also represented by salt-water acari living on algae and marine organisms or soil (Pepato and Tiago 2004). The mummy's body was wrapped in textiles and buried, and a certain degree of soil contamination was detected in the internal parts of the bundle. The body was decomposed but the skeleton remained. Therefore, it was not surprising to find these acari abundantly in microscopic analysis.

Members of the suborder Acaridida (Figure 2D) were also found. They are associated with the practice of food storage during pre-Hispanic times. Maize was one of the stored products, together with gourd, beans, peanuts, and others. The presence of those acari inside the bundle can be associated with their natural distribution in the microenvironment where those prehistoric people lived. They could also be present in the microenvironment created in the tomb. Finally, they might be associated with the presence of food remains, such as the avocado nut inside the bundle.

Actinedida was another suborder identified in this bundle. These acari are specialized in using cytoplasm of vegetal cells as food. As they were found in the inner parts of the bundle, their presence could be explained by burial practices, since leaves of coca and other plant remains have been found inside the bundle. Otherwise, their presence can be explained also by the simple contact with the soil inside the tomb. In the case of the Oribatidae they could have been preserved by salt soils of marine origin, or they may be associated with the materials of marine origin associated with the tomb (Silva 1930). Finally, they may also be associated with taphonomic factors affecting decomposition, naturally found in the graves (Franklin et al. 2004).

The absence of any specimen of acari in sample #1567 can be explained by the peculiar mineral nature of the material, possibly shell debris. On the other hand, the absence of acari in sample #1569 can be the consequence of sample bias, explained by the scarcity of the material and the small number of slides that were examined. The total number of specimens found in 200 slides was 27 specimens. These results point to different distribution and scarcity of acari in different parts of the bundle. This is also consistent with the initial negative results, reinforcing the taphonomic hypothesis. The preservation of acari in the inner parts of the bundle also contributes to the interpretation that they are ancient acari associated with the colonization of the materials inside the bundle at the time of the burial and with the process of decomposition.

Some of the acari found, such on the Oribatidae (suborder) and Tarsonemidae (family), were previously reported in mummified mortuary remains from the St Isidoro Collegiate-Basilica, Leon (Spain), dated from the X and XIII centuries. Among these remains are human bones, hair, teeth and soil from the

bottom of the graves containing many fragmentary and a small number of intact acari (Hidalgo-Argüelo et al. 2003).

All of the groups of acari found in the Chillon bundle have already been described in human as well as animal coprolites from the archaeological site of Furna do Estrago, Pernambuco State, collected in different archaeological levels from different periods. The first levels in that site are prehistoric, including the big cemetery dated between 1,860 ± 50 - 1,610 ± 70 before present (Guerra et al. 2003). Other arthropods recovered from human remains that should be mentioned are lice (Rick et al. 2002). As showed by Reinhard and Buikstra (2003), arthropods found in archaeological remains help us to understand the social relationships among ancient people. The finding of acari in this case revealed a possible new approach to the archaeological collection of mummies, aiming at better conservation of organic remains.

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Table 1: Different materials sampled and their position in the Chillon bundle.

Sample Number at **ESNP**	*Different sampled materials and their position in the Chillon bundle.*
1565	Brown spheric aggregate of unidentified material collected at the abdominal region of the mummy Positive for acari.
1566	Brown disaggregated material at the abdominal region of the mummy. Positive for acari.
1567	Small compact plates, at different points of the abdominal region of the mummy. Negative for acari.
1568	Material adherent to the textile that was probably in direct contact with the body of the mummy. Positive for acari.
1569	Textile that was probably in direct contact with body. Negative for acari.
1570	Material adherent to the ventral surface of the left ileum of the child. Positive for acari (sample 1).
1571	Material adherent to the ventral surface of the left ileum of the child. Positive for acari (sample 2).
1572	Textile of the outer layer of the bundle. Positive for acari.
1579.9	Disaggregated material on the surface of the bundle. Positive for acari.
1579.10	Disaggregated material inside the pelvic cavity. Positive for acari.

Figure 1: A – Closed bundle, before examination. Notice the destruction of the extremities. B - Open bundle with the bones of the child in anatomical articulation. Some of the bones had already been removed. (Photo: C Rodríguez).

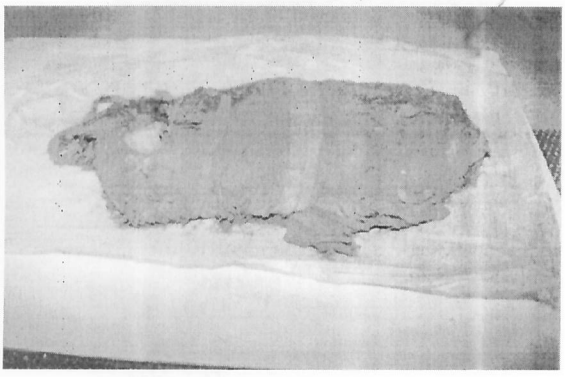

Figure 1A (left)

Figure 1B (right)

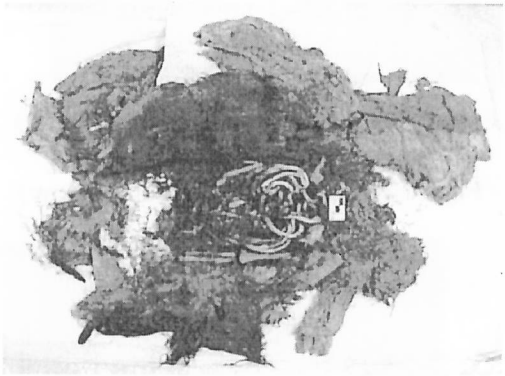

Table 2. Classification and quantity of acari found in each sample of material collected from the Chillon bundle, classified according to Krantz (1978).

Sample Number ENSP	Subclass Acari	Suborder Oribatida	Suborder Acaridida	Suborder Actinedida	Family Tarsonemidae	Total
1565	-	-	-	-	2	2
1566	-	-	-	-	3	3
1567	-	-	-	-	-	-
1568	-	1	-	1	3	5
1569	-	-	-	-	-	-
1570	-	-	-	1	2	3
1571	4	1	-	-	1	6
1572	-	-	-	-	1	1
1579.9	-	1	1	-	4	6
1579.10	-	-	-	-	1	1
Total	4	3		2	17	27

Figure 2. Acari found in a mummy bundle from the Chillon River Valley, Peru.

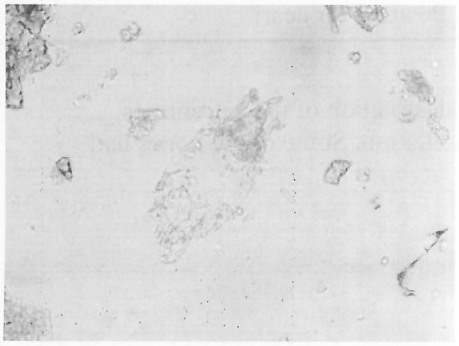

Figure 2 A: Family Tarsonemidae (above)

Figure 2B: Subclass Acari

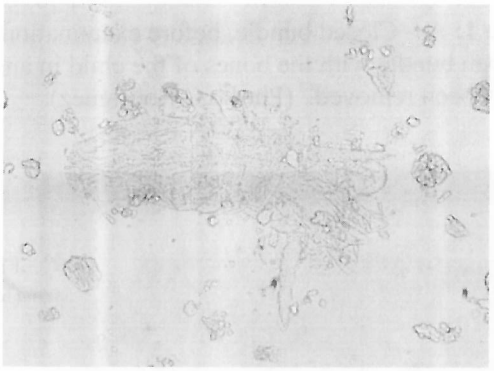

Figure 2C: Suborder Oribatida (below)

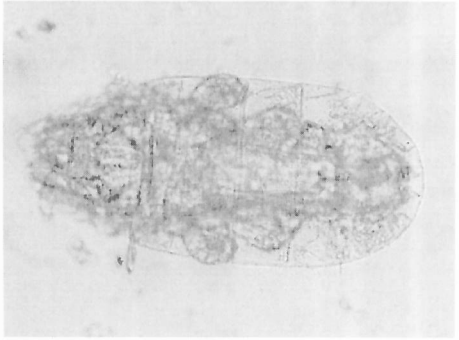

Figure 2D: Suborder Acaridida