

## THE PRINCE OF EL PLOMO: A PALEOPATHOLOGICAL STUDY

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In February 1954 three fortune seekers, spurred on by the legend of Inca gold at high altitudes, discovered the undisturbed tomb of an eight-to-nine-year-old Inca prince. The fully clothed, exquisitely preserved body, hunched in the fetal position, lay in a meter deep pit covered by a capstone and the whole covered by a tumulus 1.5 meters in height, with a stone retaining wall around it. This structure, part of a ceremonial complex, was discovered above the permafrost line at the 5,400 m (17,717 ft) level on Cerro el Plomo, a dominant mountain peak in the southernmost domain of the Inca Empire, some 45 km east of present day Santiago, Chile.

By good fortune the body and accompanying grave goods were purchased by the National Museum of Natural History, Santiago. Following the acquisition, a detailed study of the grave goods was made while examination of the body was limited to roentgenograms and coprolite analysis.<sup>1</sup> A more detailed examination of the body would have to await the lessons learned from the autopsy of various Egyptian mummies by members of the Paleopathology Association some 25 years later.<sup>2</sup>

Following the 1954 study, the body and grave goods were placed in a specially designed glass-fronted freezer in the museum. In the spring of 1982 one of us (S.Q.K.), noting some minor cracking of the epidermis of one hand and fearing that the artificial environment created in 1954 might now be inadequate, contacted the International Heritage Branch of UNESCO to hire someone with experience in the field to direct a further examination and study of the body. P.D.H. was contacted.

The original study had shown that the child's principal garment, a tunic

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(*uncu*), consisted of a rectangle of black llama wool cloth 47 cm by 94 cm decorated at each end with four narrow strips of llama fur and trimmed with red fringe. A 24 cm hemmed opening in the center allowed the child's head to pass through. The tunic was stitched down each side, leaving room for the arms to pass through. A large grey alpaca shawl (*yacolla*) trimmed in red was doubled over the shoulders. Unused leather moccasins trimmed with a red embroidered band adorned his feet. The shoulder length hair was intricately plaited in numerous rows around the head and held in place by a headband (*llautu*), which was in its turn held in place by a narrow cord under the chin. The head was crowned with a woollen headdress topped by condor feathers. Two heavy silver ornaments completed the attire, one a heavy bracelet on the left forearm, the other an H-shaped pectoral ornament suspended from a cord around the head—both signs of high social status.

Grave goods included five small bags of animal intestine containing locks of hair, deciduous teeth, and nail clippings. A beautifully constructed purse covered with red (flamingo) and white feathers contained coca leaves which are still aromatic. Two miniature llamas, one of laminated gold and the other of imported conch shell, and a silver idol 10 cm in height, magnificently attired in the manner of an Inca princess, completed the offerings.

On June 29, 1982 a multidisciplinary team began a six week study aimed at a detailed examination of the body, with particular reference to its conservation as well as the preservation of the clothing and grave goods. Reexamination of the body by radiography, combined with dental development/calcification studies, revealed the boy to be eight to nine years of age. No lesions, injuries, or growth arrest lines were observed. These studies also showed that the right first metatarsal was shorter and thicker than normal, regarded by the radiologist as an atavistic phenomenon. Complete body computerized tomography confirmed these findings and showed that all organs were both intact and in a fine state of preservation. Swabs from numerous superficial areas failed to grow microorganisms on any of the culture media employed at 0°, 22°, and 37° C. Appropriately stained sections from a skin biopsy confirmed the absence of contamination of the superficial tissues. The skin is well preserved, with fine nuclear detail. Although the epidermis is rather hard, subcutaneous tissues are soft and easily cut with a scalpel, so that minimal rehydration was necessary. Because of the unique nature of the specimen and its superb preservation, it was decided not to open a window to biopsy

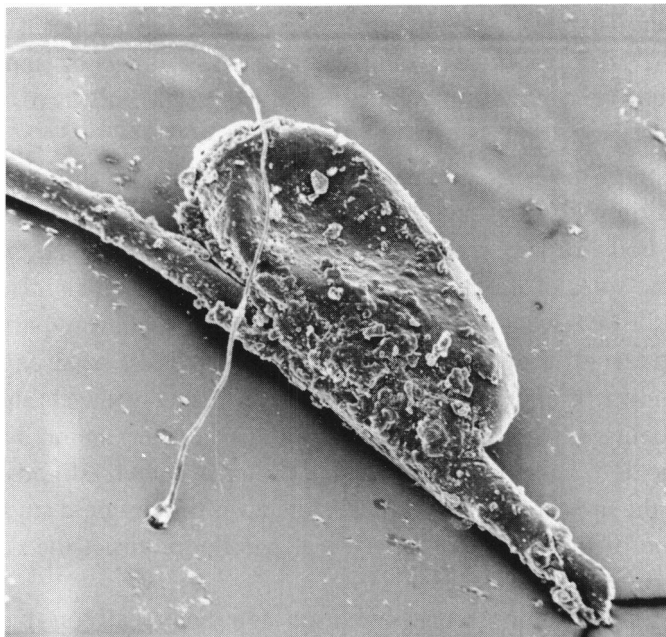


Fig. 1. Egg (nit) of *Pediculus humanis capitis*. SEM  $\times$  100

internal organs, for fear of providing an opportunity for the entrance of saprophytic organisms.

The anus is widely dilated but now empty of fecal remains; these were unavailable for examination. The 1954 study of this specimen revealed many *Trichuris trichiura* ova and some specifically unidentifiable cysts of *Entameba*.<sup>3</sup> These authors noted that no accounts of *Trichuris* are mentioned in the old world literature earlier than 1740, and suggest this parasite was carried to Europe by returning conquistadores. Since 1954, however, published accounts of the isolation of ova from this nematode in ancient man of the old world have included those from the intestinal content of a 2,100-year-old embalmed body of the Han dynasty, China,<sup>4</sup> and from human excrement found in prehistoric salt mines dated 800 to 350 B.C. in Austria.<sup>5</sup>

Ectoparasites became evident during the hair cleaning process, when numerous eggs (nits) of *Pediculus humanis capitis* were detected (Figure 1). No adult lice were found.

A small quantity of muscle tissue (< 2 gm) was submitted to Dr. G. D.

Hart and staff, Toronto East General Hospital, for blood group determination. Testing by the microelution method gave a positive result for group A.<sup>6</sup> Due to limited sample size, a full range of appropriate tests could not be carried out, and a definitive result will have to await additional material.

Examination of the body was hampered because of its position, with the knees drawn tightly to the chin, feet crossed, and hands clasped over the knees. The body of the child, who appeared well nourished, weighed 10.62 kg. The soles of the feet showed marked hyperkeratosis. The lower extremities showed what appeared to be edema, which was particularly marked on the right foot. The last four digits of the left hand exposed to the cold, unlike the clasped fingers of the right, showed subungual hematoma, being a blue/black colour. At the base of the thumb and index finger of the left hand were two small (2 mm) round, slightly raised lesions with the appearance of verrucae. Electron microscopic studies of a biopsy of one of these showed the typical papilloma virus, the causative agent of verruca vulgaris (Figure 2).

Eight ulcerated lesions were noted on the body, all on the lower extremities and, while these had been noted in the earlier study, no biopsy was performed. The lesions ranged from 0.5 to 1 cm in diameter, had well defined borders, and were covered by fibrinous exudate. Microscopic examination revealed the presence of numerous dilated vascular channels in the superficial dermis, filled with homogeneous eosinophilic material which may represent hemolysed blood. These vessels appear to be capillaries, although the possibility that they are lymphatics cannot be definitely excluded. Many are located immediately adjacent to the overlying epidermis, which sometimes appears to encircle some vessels. Similar dilated capillaries are also present in the subcutaneous fat, and some are considerably larger than those in the dermis. The epidermis is thickened and hyperkeratotic. It assumes a papillary configuration where the capillaries are most abundant. In this area the lesion is ulcerated and an acute inflammatory exudate is noted, characterized by fibrin and an infiltrate of polymorphonuclear leukocytes and possibly other types of white blood cells. The histologic features are consistent with an angiokeratoma, probably *angiokeratoma circumscriptum*, secondarily inflamed and ulcerated (Figure 3).

The boy, a member of the ultimate Inca culture, was a sacrifice to the all important god of the sun—a great honor in Inca eyes. Many descriptions of such ceremonies have come down to us in the Inca

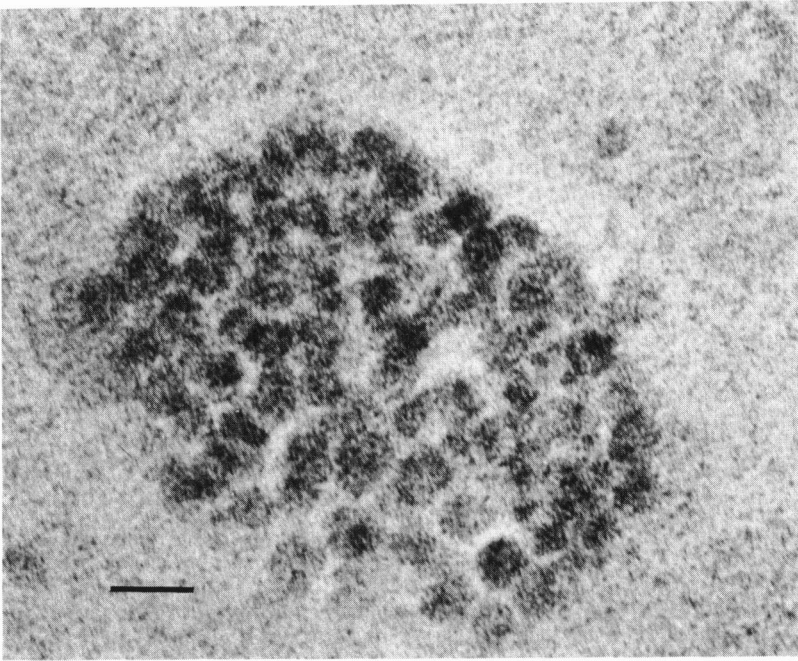


Fig. 2. Papilloma virus from wart on child's hand. Uranyl acetate—lead citrate;  $\times 300,000$   
bar = 0.03 micrometers

chronicles. Four methods of sacrifice were in use: garroting, cutting the throat, tearing the heart from the chest, and burial alive after drugging with *chica* (an alcoholic brew) to numb the senses. In this case, all evidence points to the latter, including the vomit stain on the front of the child's tunic, the huddled position for warmth, and the peaceful expression on his face. Orientation of ceremonial structures and knowledge of Inca customs suggest the sacrifice occurred at the summer solstice (December 23), the great feast of Capac Racmi. Children for sacrifice were chosen first for the capital at Cuzco and its sanctuaries, and then for all parts of the empire—perhaps the reason this child from the north was found in central Chile. Peculiarities of dress indicate that the child was from the altiplano of northern Chile or southern Bolivia, which means he must have walked over 2,000 kms to reach his destination of Cerro el Plomo.

When did the sacrifice occur? Topa Inca Yupanqui conquered Chile in 1480. Inca rule and that way of life were disrupted in 1540 by the arrival of Pedro de Valdivia. It is most likely that the sacrifice occurred within that 60-year period.

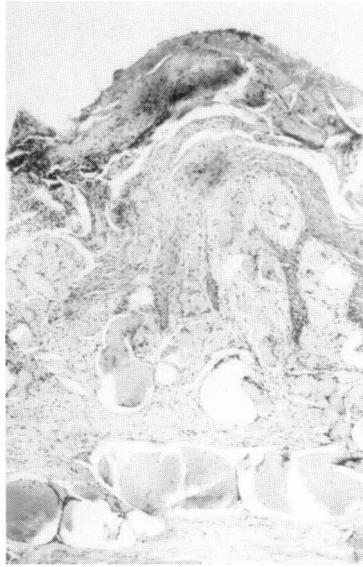


Fig. 3. Acanthotic vascular lesion. The dilated capillaries extend from the epidermis through the dermis into subcutaneous fat. Hematoxylin—eosin;  $\times 240$

What diseases were present among native American Indians at the time of conquest and which were imported from Europe is a question often faced by paleopathologists. For example, was smallpox endemic among the native Indians prior to conquest? Is the pockmarked face of the mummy of Rameses V mute testimony that this same disease existed in Egypt 1,000 years before the birth of Christ? Now, for the first time, we have proof that viruses do persist in mummified remains for hundreds of years, and, by applying appropriate techniques, we can begin to probe the origins of a disease which has plagued mankind, perhaps for millennia.

#### SUMMARY

The ancient body of an Inca boy of royal status was discovered frozen at high altitude in the Andes near present day Santiago, Chile. Deep freeze conditions and dry environment left the body in excellent preservation. The young boy, a sacrifice to the sun god, was buried with numerous grave goods, the study of which has added much to our knowledge of Inca culture. The sacrifice most likely occurred between 1480 and 1540 A.D. Examination of the body revealed *Trichuris* ova and common head louse nits. Electron microscopic studies of verrucae from the hand revealed

viruses—the first seen in ancient material. Another skin lesion proved to be an angiokeratoma.

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