PART I. ANALYSIS OF HAIRS IN LOVELOCK CAVE COPROLITES

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Archaeological sites often contain loose hairs, or pieces of hide having attached hairs. In some sites, coprolites of the prehistoric peoples may be present, and these may also contain hair of species that were eaten. The knowledge of the kinds of animals represented by such hairs can be of considerable value in helping to interpret what animals were used for various purposes by the people under study. Through microscopic analysis of hair, it is often possible to determine what genus or even what species of animal is represented. This report is concerned with the identification and analysis of hairs from coprolites found in Lovelock Cave, Nevada.

Human hair from mummies and from various archaeological sites has been studied extensively, whereas hair of the mammals has received much less attention. Earlier research on human hair is summarized by Brothwell and Spearman (1963). The relative lack of research on hair of other mammals led these authors (1963:428) to conclude that "...Only human scalp hair has yet been studied in sufficient detail to be of value in anthropology or archeology." Persons involved in the study of mammalian food habits and in identification of hair from archaeological sites could not concur with this conclusion.

The detailed studies by Brown (1942), and later reports by Appleyard and Wildman (1963), and Douglas (1965) have led to renewed interest in the study of hair from archaeological sites in this country. Recent studies by Callen (1963) and by Colyer and Osborne (1965) have shown that food habits of primitive peoples can be studied in detail by analysis of seeds and fragments of hair and plant epidermis contained in their coprolites.

The woolen industry has long been the leader in hair investigations, both in this country and in Europe. By comparison, the study of hair in wild mammals is still in its infancy. In addition to its pragmatic application in sheep breeding, the analysis of hair can provide valuable data for the study of food habits in mammals or in

raptorial birds, as well as for the study of archaeological materials.

Hair is composed of keratin, and is made up of three layers, an inner medulla, an intermediary cortex, and an outer cuticle. The cortex usually makes up the bulk of the hair. The cuticle is composed of overlapping cells that form diagnostic patterns on the surface of the hair (Brown 1942; Cockrum 1962; Douglas 1965). Pigment granules usually are present in various locations within a hair, and can also be of diagnostic value. The nomenclature for parts of hairs, kinds of medullae, and configuration of epidermal scales has been standardized, and is illustrated by Brown (1942).

One of the problems attendant in identifying hair from archaeological sites is that they usually are fragmentary, and, depending upon their provenience, they may be more or less eroded. The more fragmentary the hair, or the more eroded the cuticular layer, the more difficult it is to identify, with certainty, the species of mammal from which it came.

Methods

Individual hairs were identified microscopically by comparing them with mounts and cuticular impressions of hairs from identified mammals. Reference slides were prepared, for this and other studies, from hairs of study skins housed in museum collections at the University of Kansas, at the University of Texas, and in my personal collection.

Each hair was examined for the following: relative diameter; presence or absence of medulla; the type of medulla; diameter of the cortex and medulla in relation to diameter of the hair; shape of medullary partitions; size and shape of the spaces delimited by partitions; location of pigment granules; and the cuticular pattern.

Cuticular impressions were prepared by the Turtox Micro-Replica method.[1] In this method the hair is placed on a glass plate, flooded with acetone, and impressed with a plastic coverslip. The impression remains in the coverslip, which is taped, impression side down, to a microscope slide for examination.

Results

Thirty-nine slides of coprolite or "scat" contents contained 43 hairs. The kinds of mammals represented, and the number of occurrences (no. of slides) of each is as follows:

Primates

25 *Homo sapiens* (human)

Rodentia

2 *Eutamias* sp. (chipmunk)
1 *Peromyscus* sp. (deer mouse)
1 *Neotoma* sp. (wood rat)

Carnivora

6 *Canis* sp. (coyote, wolf, or dog)
1 *Ursus americanus* (black bear)
3 *Bassariscus astutus* (ringtailed cat)

Artiodactyla

2 *Odocoileus hemionus* (mule deer)

Unidentifiable

2 hair fragments

"ENTRANCE" COPROLITES

Coprolite E-29:

Slide #221 (a) *Canis* sp. One small hair, 18mm. in length.
(b) *Homo* sapiens. One small hair.

Coprolite E-38:

Slide #384 *Peromyscus* sp. (deer mouse). One partial hair, 7 mm. in length. The cuticular pattern resembles that of *P. truei*, the pinyon mouse. The medulla is not visible, but this is not surprising since this is only a fragment of the total hair.

"INTERIOR" COPROLITES

Coprolite I-13:

Slide #71 Canis sp. (dog, coyote, wolf). One hair 13mm. long. Some cuticular pattern is visible, and is indistinguishable from that of coyote. This size of hair and type of medulla is common to several canids.

Slide #154 Odocoileus hemionus (mule deer). One hair of underfur, 13mm. long. The hair is indistinguishable from my slides of hair from O. hemionus, and that species is the only one that would be expected in the area.

Coprolite I-14:

Slide #77 Canis sp. One hair. Cuticular pattern indistinguishable from that of coyote. The medullary pattern differs somewhat from those in my reference slides. This may be due to individual variation, or the hair may be from a dog.

Coprolite I-21:

Slide #172 Bassariscus astutus (ringtailed cat). One hair 35mm. long.

Coprolite I-39:

Slide #402 Odocoileus hemionus. One small fragment of hair, about 10mm. long.

Coprolite I-40:

Slide #432 Unidentifiable fragment of hair, about 6mm. in length.

Slide #433 Canis sp. One fragment of hair of underfur, 4mm. in length. Too small to permit making an impression.

Slide #434 Unidentifiable. One hair about 20mm. long. The cuticle has been eroded and the pattern is indis-

tinct. Cuticular impressions were unsatisfactory; no medullary pattern is present.

Coprolite I-41:

Slide #462 Canis sp. One hair, 10mm. in length.

Slide #463 (a) Canis sp. One hair, 12mm. in length.
(b) Down feather.

Coprolite I-43:

Slide #444 Bassariscus astutus. One hair, 20mm. in length.

Slide #448 (a) Eutamias sp. (chipmunk). Two hairs.
(b) Homo sapiens. One hair.
(c) Plant fibers and epidermis.

Slide #450 (a) Neotoma sp. (woodrat). Several dozen hairs.
(b) Homo sapiens. One hair.
(c) Down feather.

Slide #451 (a) Eutamias sp. Several dozen hairs, each about 8mm. long. Similar in cuticular and medullary patterns to E. quadrivittatus, the Colorado chipmunk, although it probably is from another species.
(b) Feather fragment.

Slide #476 Bassariscus astutus. One hair, 14mm. in length.

Coprolite I-50:

Slide #540 Ursus americanus (black bear). Tip of one hair from a black bear or other large mammal. The medulla is not present in this fragment, which is 8mm. in length. The cuticular pattern was checked against dozens of slides of hairs from all species of mammals that could possibly have lived in the area. It is most similar to hair of a juvenile black bear, but I consider the identification as rather tenuous and in need of verification by additional samples of hair.

Coprolite I-55:

Slide #513 (a) Homo sapiens. One hair, 10mm. in length.
(b) Feather fragment.
(c) Tracheary elements, spores ?

The following coprolite slides contain human hair: E-11 (281, 282), E-29 (222, 223, 224), E-44 (563, 572), E-46 (550), E-47 (501, 505, 507), E-56 (620, 622, 625). I-8 (155), I-20 (202), I-34 (265), I-40 (431) I-41 (461), I-55 (513, 522).

Discussion

When analyzing human scats for food items, the investigator must be cautious about considering all scat contents as having been food items of the subjects. There are several ways in which hairs might become part of the scats of Lovelock inhabitants. The hairs could have been on the ground and become incorporated into the fresh scat; the hair could have been carried into the food by a human carrier, animal carrier, or by the wind; or the hair could have been ingested along with the flesh of the animal represented.

Mammalian hairs are especially apt to be intrusive items in foods of aboriginal peoples, or of contemporary persons with primitive methods of food preparation. Most mammals have fine underfur that when shed is especially likely to be transported for short distances by air currents. Anyone who is familiar with house cats knows how their hair can float about a room on the slightest air currents. If a cat is present in a house, such floating hairs can easily appear in foods prepared in the most modern and, otherwise, sanitary of kitchens. It is not surprising that the inhabitants of Lovelock Cave ingested a wide variety of hairs with their foods.

The chief problem is to separate those hairs that were intrusive into the diet from those that were ingested in conjunction with the flesh of animals. Obviously, a human hair or two in scats of Lovelock inhabitants does not indicate them to have been cannibalistic. If, on the other hand, dozens of human hairs had been found in many such scats, we might be highly suspicious that this indicated more than careless preparation of food. Although there would be general agreement that a solitary human hair in a scat is an intrusive item, there might be less agreement about a single hair of, say a small mammal. It seems

to me that one should be reluctant to equate the presence of a solitary hair of any animal, found in a scat, with that species having been a food item. Such might have been the case, but there is an equal possibility that such a hair might have been intrusive and related in no way to the items comprising the meal.

If this premise is accepted, what can be learned by examining hairs from prehistoric scats? I think that a great deal can be learned because some hairs will unquestionably indicate animals that were used for food, whereas others will indicate what animals were contemporaneous with the prehistoric people under study. Either situation yields positive information.

Intrusive hairs, other than human, would indicate that the animals represented were present in the shelter either as pets, as nocturnal pests (as in the case of rodents or some carnivores), or that their fur was used as clothing, blankets, etc. It would be most unlikely that even the smallest, lightest of hairs would have blown into the food from anywhere other than the immediate cave environment of the Indians.

On the basis of the number of hairs present in the scats, it is apparent that the inhabitants of Lovelock Cave ate chipmunks, woodrats, and deer. Chipmunks and woodrats were represented by numerous hairs. These small mammals are easy to skin, but small tufts of hair could be overlooked easily in the skinning and cleaning operation. The fineness of their hair makes it difficult to skin such animals without leaving a few hairs on the meat.

Deer, although represented by only one hair in each of two scats, was almost certain to have been a food item. The possibility remains that deer hair may have come from a garment constructed of hide, or might have blown into food from a pile of hair left from a skinning operation.

The occurrences of hairs of the ringtailed cat, in each of two scats, is somewhat puzzling. Bassariscus is a nocturnal carnivore, and it seems unlikely that the Indians would have had much opportunity to secure these animals. Nevertheless, ringtailed cats could have been caught in snares set for other small mammals, and if so, there is no

reason to suppose they would not have been eaten. It is also possible that the attractively marked fur of this animal might have been sought after; the skin is reasonably durable and the pelt is large enough to be usable for numerous purposes. Ringtailed cats inhabit rocky areas, and it is therefore possible that the hairs might have been shed while the animal was raiding a cache of food supplies in the cave.

The hairs of deer mice and dog (coyote?) probably represent intrusive items in the diets of the Lovelock inhabitants. Deer mice are nocturnal visitors to any available source of food, and they could be expected to congregate around an inhabited rock shelter. Although Indians in the plains and in northern Mexico were known to eat mice, a single hair of Peromyscus does not provide ample evidence that the Lovelock inhabitants did so.

Single hairs of Canis sp. occurred in five scats, and I think that these hairs probably blew into foods and were inadvertently ingested by the Indians. It is likely that these hairs were from dogs that lived as pets with the Indian inhabitants.

The possible presence of black bear is indicated by one fragment from the tip of a large hair. The cuticular pattern of this fragment is indistinguishable from that of black bear. No medulla is present and, as a consequence, the identification is somewhat tenuous. Bears are inhabitants of woodlands, which indicates that hunting parties may have ranged far from the shelter. The hair might also have come from a bear skin robe or blanket obtained through trade.

NOTES

[1] Micro-Replica Kit is available from General Biological Supply House, 8200 S. Hoyne Avenue, Chicago, Illinois 60600.