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A Mimbres Burial with Associated Colon Remains from the NAN Ranch Ruin, New Mexico

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The skeletal remains of an adult male associated with desiccated tissue and a coprolite were recovered from an open-air midden deposit at the NAN Ranch Ruin (LA15049), a large Mimbres site in Grant County, New Mexico. The find dates to about A.C. 1000–1100. Identifiable macroscopic elements in the coprolite consist of finely fragmented corn and tiny seed fragments of an unknown plant. High amounts of willow (Salix) and mustard (Brassicaceae) pollen may indicate the ingestion of medicinal plants to combat a deteriorating health condition. The individual was approximately 35–40 years old at the time of death and suffered from numerous pathological disorders including a basioccipital tumor, osteoarthritis, spondylolysis, and a sacral deformity. The find illustrates that conditions do exist at open sites in arid environments of North America that preserve desiccated coprolites with burials. When coprolite analysis is combined with osteological studies significant information on health care and diet can be obtained.

Introduction

The skeletal remains of an adult male (Burial 109) associated with desiccated tissue and a coprolite were recovered by Texas A & M University archaeologists from an open-air midden deposit at the NAN Ranch Ruin (LA15049), an ancient Mimbres site in Grant County, New Mexico (FIG. 1). The preservation of desiccated tissue was not uncommon in burials from the NAN Ranch ruin, and traces of organic material such as textile remnants and other normally perishable artifacts have been recovered from other Mimbres burials (Bradfield 1931; Shafer 1986a; Shafer, Taylor, and Usrey 1985). Burial 109 represents the first time that desiccated colon contents have been recovered from a Mimbres grave, however.

The desiccated coprolite provides a hitherto unencountered opportunity in the Mimbres area to evaluate the contents of an individual's last meal or meals. The general health condition of the person at the time the meals were ingested is an important factor in understanding the nature of the diet. Therefore, thorough analyses were conducted on both the human and dietary remains; the desiccated coprolite was analyzed to identify the foods last ingested by the individual; and an intensive skeletal analysis was conducted to evaluate age, sex, and evidence of

trauma that may have led to the cause of death or to conditions that may have contributed to discomforts and pain during life.

The NAN Ranch Ruin is a large, pithouse/pueblo site once inhabited by people of the Mimbres Mogollon culture, an agriculturally-oriented tradition that had its beginnings ca. A.C. 200 (Anyon, Gilman, and LeBlanc 1981). Geographically the Mimbres area is concentrated along the Mimbres River drainage in sw New Mexico (FIG. 1). The earliest Mogollon settlements are round pithouses with extended entrances. These Early Pithouse Period sites are associated with scatters of plain, brownware pottery. A general shift in pithouse form from oval to rectangular occurred ca. A.C. 650 in the Late Pithouse Period. The appearance of white slipped ware, Three-Circle Red-on-white followed by Mimbres Boldface Black-on-white and Transitional Black-on-white (or Mimbres Styles I and II Black-on-white, respectively, of Brody, Scott, and LeBlanc 1983) provide the hallmarks of the Late Pithouse Period. A shift from pithouses to surface pueblo architecture occurred with the onset of the Classic Mimbres Period ca. A.C. 1000. Changes in mortuary behavior favoring subfloor burial and the production of the finely painted Mimbres Classic Black-on-white (or

Figure 1. Map of the Mimbres area and the location of the NAN Ranch Ruin (LA15049). Inset shows the location of the site in sw New Mexico.

Mimbres Style III of Brody, Scott, and LeBlanc 1983) mark the period of peak population and agricultural intensity for the Mogollon cultural sequence (Blake, LeBlanc, and Minnis 1986; Minnis 1981). The Mimbres Mogollon tradition came to an end about A.C. 1150 when all of the Classic Mimbres sites were abandoned and the valley was essentially vacated (Anyon, Gilman, and LeBlanc 1981).

The settlement at the NAN Ranch Ruin was established near the beginning of the Late Pithouse Period. A sequence of pithouses from round to rectangular is followed by cobble-adobe structures with slightly sunken floors. These latter structures bridge the transition from pit dwellings to pueblos of the Classic Mimbres Period. Core rooms to the surface pueblo were constructed during the Classic Mimbres Period; the pueblo grew to include at least three room blocks (i.e., multi-room complexes) of from 12 to 50 rooms each. The occupation at the site was apparently continuous from about A.C. 600 to ca. A.C. 1150, when this and other Mimbres pueblos were abandoned and the people left the valley.

Extensive investigations were conducted at the NAN

Ranch Ruin by Texas A & M University beginning in 1978 (Shafer 1982; Shafer and Taylor 1986). The project capitalized on the opportunity to explore thoroughly one of the few remaining unexcavated Classic Mimbres pueblos in the Mimbres Valley and succeeded in defining many new patterns in large Classic Mimbres settlements. The dynamics of architectural growth, change, and household composition have been traced in other publications (Shafer 1982; Shafer and Taylor 1986). The patterning of indoor and outdoor activity has provided new information on room function and space use in and around a multi-household settlement (Shafer 1982, 1987). An analysis of structural timbers has shown that the riverine woods had not been depleted as previous studies had suggested (Bruno 1988). And burial analysis has provided new information and patterning on mortuary behavior (Shafer 1988) and demography (Patrick 1988).

The intensive excavations were concentrated largely in and around the East Room Block, one of at least three multi-household architectural complexes at the site (FIG. 2). Data on 128 burials were obtained from the East Room Block area; the majority were buried beneath the

Figure 2. Plan of the NAN Ranch Ruin (LA15049) showing extent of excavation at the end of the 1985 season.

floors of habitation rooms (Shafer 1982). The preservation of the skeletal remains varied from poor to very good. A conscientious effort was made to conserve the skeletal

material in order to conduct thorough osteological and demographic studies. Preliminary and current osteological studies indicate that numerous pathological disorders are

Figure 3. Plan of the Southeast Midden Area excavations and schematic profile showing relative horizontal and vertical position of Burial 109.

present in specimens of all ages (Diane Young, personal communication, 1988).

Testing of the Southeast Midden Area, a mounded Late Pithouse Period/Classic Mimbres midden deposit SE of the East Room Block, led to the discovery of numerous features (Shafer 1986b, 1987, 1988) including Burial 109 (FIG. 3).

Burial 109

Burial 109 was placed flexed in an upright or sitting position (FIG. 4) in a pit that was dug from the Classic Mimbres midden and which penetrated an underlying loose, ashy Three-Circle Phase midden deposit (Shafer 1986b). There were no artifacts associated with the burial. The combined factors of soil condition and arid environ-

Figure 4. Partial excavation of Burial 109 showing sitting position as viewed looking sw.

ment contributed to the preservation of desiccated tissue and coprolite remains in the abdominal region and to the generally good condition of the skeleton. The articulation of the bones was only minimally disturbed by burrowing rodents.

The coprolite remains were discovered in the pelvic cavity, adjacent to the sacrum, prior to the removal of the *os coxae* or innominates (FIG. 5). The location of the coprolite within the pelvic girdle was consistent with that of the descending colon. The absorption of water by the large intestine may have, by dehydrating the unexpelled stool, increased the likelihood of preservation of the coprolite. Had the fecal matter been in the small intestine at the time of death, it would have still been liquified and, possibly, less likely to have been preserved. The coprolite specimen was collected immediately upon exposure and sent to Texas A & M University for analysis.

Analysis of the Colon Remains

The fact that intestinal contents were found in an individual otherwise reduced to a skeleton is of major sig-

nificance. Although it is not unusual to find the colon contents in naturally mummified or partially mummified inhumations excavated from dry caves, this is the first report that identifiable colon remains have been found in the pelvic cavity of an individual recovered from an open site in the American Southwest. The colon is the organ in which feces are, among other processes, dehydrated prior to defecation. Burial 109 is of particular importance because it suggests that careful excavations may yield similar remains at arid sites throughout the world.

The colon contents were recognized as a concentration of small, brownish, organic lumps of consistency and color differing from the surrounding soil matrix. The contents represent some of the individual's last meals.

Materials and Methods

Five samples, including two from the colon and three control soil samples excavated from the burial pit, were analyzed at the Palynology Laboratory, Texas A & M

Figure 5. Burial 109 pelvis showing location of coprolite as viewed looking west; arrow points to coprolite and trowel points north.

Table 1. Pollen counts from the soils and colon contents of Burial 109.

Taxa	Sample 1*		Sample 2*		Sample 3*		Sample 4*	
	No.	%	No.	%	No.	%	No.	%
Asteraceae								
Low Spine	1	0.1	3	1	1	0.5	—	—
High Spine	—	—	1	0.5	—	—	—	—
<i>Artemisia</i>	—	—	1	0.5	—	—	—	—
Brassicaceae	532	53	—	—	—	—	—	—
Cactaceae	—	—	2	1	1	0.5	—	—
<i>Cucurbita</i>	12	1.1	—	—	—	—	—	—
Cheno-Am	76	7.5	141	67	114	54	73	59
Fabaceae	—	—	—	—	—	—	1	—
<i>Pinus</i>	—	—	9	4	3	1	4	3
Poaceae	6	0.5	22	11	36	17	15	12
<i>Zea</i>	104	10.3	18	9	44	21	22	18
<i>Salix</i>	262	26.1	1	0.5	—	—	—	—
<i>Typha angustifolia</i>	1	0.1	—	—	—	—	—	—
<i>Typha latifolia</i>	12	1.1	—	—	—	—	—	—
Apiaceae	1	0.1	—	—	1	0.5	—	—
Unidentified	4	0.3	11	5	11	5	9	7
Total	1011		209		211		124	
<i>Lycopodium</i>	8		77		120		129	

*Provenience of the soil and pollen samples from Burial 109. Sample 1 (FS445): colon contents from Burial 109; Sample 2 (FS446): soil sample, Burial 109 grave fill; Sample 3 (FS447): soil from atop left pelvis of Burial 109; Sample 4 (FS449): soil from beneath pelvis.

University, by Reinhard (1986). Of organic material from the colon, 11 g were examined for macroscopic, microscopic, and parasite remains, and 2.5 g were analyzed for pollen. Each of the control samples of soil had 30 g analyzed for pollen.

The 11-g fraction from the colon contents was placed in a rehydration solution of 0.5% trisodium phosphate (Na_3PO_4), the standard one used with coprolites (Callen and Cameron 1965; van Cleave and Ross 1947). To facilitate rehydration and breakdown of the remains, they were agitated every six hours with a magnetic stirrer; after 30 hours of rehydration, the remains were ready for processing. This consisted initially of screening the reconstituted material through 0.5 mm and 0.15 mm mesh screens in a fine jet of distilled water. The water passing through the screens was captured in a large beaker and concentrated by centrifugation. The larger screened fraction was dried and studied for macroscopic dietary remains. The smaller screened residues and centrifuged sediments were analyzed for the presence of parasites (Ferreira, de Araujo, and Confalonieri 1980, 1983; Reinhard 1985a, 1985b; Reinhard, Ambler, and McGuffie 1985; Reinhard, Hevly, and Anderson 1987).

Pollen analysis was conducted with another fragment from the colon weighing 2.5 g. To enable quantification of the pollen remains, *Lycopodium* tablets containing about 11,200 spores were added to each of the three pollen control samples and one tablet to the colon pollen sample. The addition of tracer spores allows for calculation of the number of pollen grains present per gram of sediment.

Only one tablet was added to the colon content sample, which was substantially smaller than those from the controls.

Standard palynological extraction procedures were applied to the four pollen samples. It is a standard practice in pollen analysis to count 200 pollen grains from each sample to ensure statistical validity of the count. In some cases, however, pollen was not present in quantities sufficient to obtain such a count. This was the case with Sample 4, a control from beneath the pelvis. In each of the other control samples, however, a minimum of 200 grains was counted. In the coprolite (Sample 1), pollen was so abundant that more than 1,000 grains were counted in just a few hours.

The raw pollen counts and percentage calculations for each sample are presented in Table 1. The percentage calculations from Sample 4 are presented with the caveat that they may not be statistically representative of the soil's pollen spectrum.

Macroscopic Remains

The macroscopic materials from the colon had apparently been finely ground before ingestion, a circumstance that eliminated the possibility of identifying most remains. The material that was identifiable consisted primarily of charcoal and tiny seed fragments. One quarter of an unidentified small black seed, badly broken, was found. Several fragments of finely fragmented maize seed coats were also identified. No fiber was found in the macroscopic remains, and since fiber is frequently found in coprolites

from the American Southwest and was a large part of the prehistoric diet (Aasen 1984; Fry 1976; Fry and Hall 1975; Reinhard 1985a; Stock 1983; Williams-Dean 1978) the absence is notable. The presence of finely ground remains and the absence of fiber in the coprolite from Burial 109 indicates that the last meals of this individual were different when compared to the meals inferred from other American Southwest coprolite studies (also see Aasen 1984; Fry 1976; Fry and Hall 1975; Stock 1983; Williams-Dean 1978). The unusual nature of the coprolite remains suggests that the man was not fed solid foods during the later stages of his life. The finely ground material is more typical of a soup or gruel.

Microscopic Remains

Most of the microscopic remains examined consisted of amorphous fecal debris. No tracheids or phytoliths that are normally present due to mastication of fiber were found. There were no fungal spores and hyphae that would indicate fungal growth. The absence of fungus suggests that aerobic decomposition of the colon contents was limited.

Parasite Analysis

The screened microscopic sediments (i.e., the fraction that passed through the screen) were analyzed for parasite remains (Reinhard 1988; Reinhard, Ambler, and McGuffie 1985). Since it is possible to identify both parasitic helminth eggs and larvae in coprolites and colon contents of mummies, if this individual had carried parasitic worms in the intestinal tract it is likely that they would have been discovered. No parasite remains were found.

Pollen Analysis

Pollen was abundant and well preserved in the colon remains. Pollen was less abundant in the control soil samples and represented a different spectrum than that within the colon. The pollen counts and percentages are presented in Table 1 and are discussed below.

The pollen counts clearly show the difference between the colon contents (Sample 1) and the control samples taken from soils around the burial. The differences are seen in both the variety and proportion of pollen types. The control samples taken from the midden soils show a predominance of pollen from the Chenopodiaceae and/or the Amaranthaceae (both weedy plants) with a strong presence of small-sized pollen grains of the Poaceae (grass family). Although these plants were consumed in prehistory, their presence in the midden could also be the result of natural pollen rain. The next most common type of pollen in the midden was maize (*Zea mays*). This pollen was undoubtedly introduced by human activity. The small

percentages of other pollen types such as the asters, pines, and willows (*Salix*) are almost certainly environmental types. Environmental types include mainly wind-dispersed (anemophilous) pollen. Because the pollen was wind-dispersed, these types could have been accidentally ingested with water or inhaled and consequently do not necessarily indicate dietary usage.

In contrast, the colon contents exhibit a dominance of mustard (Brassicaceae), willow (*Salix*), and maize pollen. Willow produces a wind-dispersed type of pollen and therefore might have been ingested by drinking water or inhaling. Considering the large percentage of the pollen, however, it is almost certain that the willow pollen had a deliberate, dietary origin. Had the pollen been introduced through inhalation or drinking, one would also expect higher proportions of Poaceae, and Chen-Am pollen (i.e., pollen of all Chenopodiaceae and the genus *Amaranthus*) since these are also wind-pollinated plant types. Although plants in the families Chenopodiaceae and Amaranthaceae were of dietary value, pollen of these families recovered from the colon may be due to inhalation of pollen or consumption of water contaminated with wind-borne pollen. Other dietary pollen types identified in the colon contents include cattail and squash. Pollen of the Apiaceae (weedy plants such as Queen Anne's lace) and Poaceae were also identified but these were probably environmental types and do not necessarily reflect dietary uses for these plants.

Approximately 450,000 pollen grains per gram of coprolite were present. This large amount suggests that plants whose pollen was present in such large quantities were surely part of the individual's final meals. The amount of mustard pollen greatly exceeds the amount that would normally occur in the natural environment since mustard is an insect pollinated (or zoophilous) plant and produces only one-tenth of the pollen per flower that wind-pollinated plants produce. The high amount of willow pollen also suggests a dietary origin. These pollen types were probably introduced either by direct consumption of flowers or by consumption of a "tea" derived from the flowers and buds. The lack of plant fiber, tracheids, and phytoliths suggest a "tea" origin.

The most likely interpretation is that the willow and mustard pollen were introduced by the consumption of tea brewed from these plants. This interpretation is supported by the relative absence of grit from grinding stones in the colon contents and the lack of anther fragments which normally accompany the consumption of flowers. In tea, the anthers would have been broken up by water action and what grit was present would have settled out of the fluid. It is probable that the corn pollen, and per-

haps some of the Cheno-Am pollen, was introduced by consumption of finely ground grain.

Season of death can be inferred from the variety of pollen types in the colon. The willow pollen is probably the result of consumption of tea brewed with willow catkins or buds. Since willow pollinates in the late spring, the individual probably died in that season.

The probable environmental pollen types in the colon are low spine Compositae, grasses, and Cheno-Am. The presence of these types in the microscopic sample is consistent with the sorts of pollen present in the late spring, although grasses and Cheno-Am types continue to flower through the fall.

The presence of *Salix* and Brassicaceae pollen has important implications for understanding Mimbres medical practices. Both plants were widely used by native Americans for medicinal purposes throughout the American Southwest (Moerman 1986). Salicin, an aspirin-like pain killer, is present in willow bark, which is known to have been used by native Americans to relieve pain (Vogel 1970: 392, 393). The Pima Indians used the foliage of the plant in making a medicinal tea (Vogel 1970: 393). The pollen could have been introduced into a tea made in this way and consumed.

Osteological Analysis

The skeletal remains were analyzed at Texas A & M University Archaeological Research Laboratory by Marek (1986). The remains were generally intact and undisturbed since deposition. The postcranial remains were well preserved, but the skull was in poor condition and the dentition was especially friable.

Skeletal analysis has determined this individual to have been a large adult male. Gender was estimated on the basis of the narrow subpubic angle and sciatic notch. Pre-auricular sulci (generally a female trait) are present, with the right sulcus more developed than the left, but their presence is postulated to be the result of a vertebral and sacral disorder described below.

Age estimations for the individual based on the pubic symphyses were considered here to be the most accurate. Using the McKern and Stewart (1957) method, an age of 23 to 39 years, with a mean of 29.18 ± 3.33 years was obtained. Using the more recent method developed by Meindl et al. (1985), an age estimate of 35 to 40 years was obtained. In combination with other aging criteria, the degree of arthritic activity, and the general skeletal appearance, it was concluded that the person represented by Burial 109 was about 35 to 40 years of age at the time of death. (See Marek 1986 for a summary of all aging criteria utilized for this burial.)

Figure 6. Prominent depression from a cyst or tumor in the basilar suture of the occipital.

The stature of Burial 109, based on Trotter and Gleser's (1958: 120) formula for Mexican male femora, was 172.5 ± 2.99 cm, or approximately 5'8". A large chest is suggested by a few widely splayed rib fragments. The remainder of the bones are also large, but in keeping with the gracile nature of the Mimbres population, muscle attachments are not unusually robust.

Pathological Conditions

The bone of the cranial vault was rather thick, dense, and compact, especially in the most superior, anterior portion of the parietals. The bone was thickest along the sagittal suture and thinned out radically from there. The skull displays severe occipital flattening, a common form of cranial deformation seen in this population, and the thickness of the parietal tabular bone may be a result of this practice. It is also possible that this cranial thickening may be anemic in origin (El-Najjar et al. 1976; Stuart-Macadam 1985). There was a slight pitting of the exterior cranial surface on both the left side of the occipital and on the parietals along the sagittal and coronal sutures. This pitting was not considered to have been actively pathological at the time of death, and it may be indicative of anemia at an earlier age (Stuart-Macadam 1985; Walker 1985). Pathological pitting of the cranial surface is common among the juvenile remains of the NAN Ranch Ruin skeletal sample.

Several small cysts and/or lesions are evident, the most significant of which was a prominent depression on the basilar suture of the occipital (FIG. 6). The depression was lined with smooth, compact sclerotic bone and it appeared that some type of cyst or tumor had existed in the cavity. Most of the articular surface was taken up by the depression, and additional internal bone deposition that may

Figure 7. Inferior view of spondylolysis of the fifth lumbar vertebra; photo also shows "bony spur" formations on the surface of the centrum.

Figure 8. Anterior view of sacrum showing tilting of the first sacral element.

Figure 9. Posterior view of sacrum showing malformation.

have served for articulation with the sphenoid was found on the superior surface of the basilar part. This suggests that the cyst was present prior to the closure of the basilar suture, which generally occurs between 17 and 18 years of age (McKern 1970; Steele and Bramblett 1988). There was no evidence of infection in the bone lining the depression, nor was there any evidence of infection in the surrounding bone. The articular portion of the sphenoid was not recovered and is therefore not available for comparison.

Trauma

A condition known as spondylolysis was indicated by an asymmetrical break in the neural arches of the fifth lumbar vertebra (FIG. 7). Superiorly, this break divided the left superior articular process in half and occurred on the right between the superior and the inferior articular processes. Inferiorly, the break occurred just below the inferior articular process on both sides. The surfaces of the break indicate that the bone was in the process of remodeling to smooth the jagged edges of bone, but the lack of a callus formation indicates that synostosis would probably not have occurred.

A malformation of the sacrum was indicated by a tilting of the first sacral element. This malformation may have been congenital, but it was concluded that it, along with the associated spondylolysis of the fifth lumbar, was traumatic in origin. Anteriorly, the right inferior margin of the element was pressed downwards and fused to the right superior margin of the second element, while the left anterior margins remained unfused (FIG. 8). Posteriorly (FIG. 9), the lamina directly to the right of the medial sacral crest appeared elongated where additional bone growth bridged the gap resulting from the upward displacement of the right margin. Likewise, the sacral fora-

Figure 10. Closeup of auricular surface of innominates showing anomalies.

men on this side was also elongated. The lamina on the left was compressed and broken, with a corresponding large opening into the sacral canal where growth of the lamina bone is incomplete (Steele and Bramblett 1988: 136).

Both the right and left lateral joints of the first sacral element are ventrally and dorsally well fused. Structurally, a lack of observable indicators of trauma both in the ala and especially on the right auricular surface indicates that the injury must have occurred sometime prior to the age of 17 years, before the fusion of the lateral joints had begun (McKern and Stewart 1957: 147–156). If the individual had been older and the lateral joints been fused at the time of the injury, such extensive remodeling of the ala and auricular surfaces probably would not have occurred, and the area would have exhibited more apparent scarring.

The *os coxae*, or innominates, have also been affected by the sacral injury. The tilting of the first sacral element had caused a slight tilting of the entire pelvic girdle. Most affected are the auricular surfaces of the innominates (FIG. 10). The superior portion of the left and right auricular

surfaces have been shortened and lengthened respectively. There was an additional wear facet on the auricular surface near the posterior superior iliac spine of the right innominate, where this surface was contacting a tubercle of bone located on the rudimentary transverse process of the sacrum, immediately to the right of the second posterior sacral foramen.

The disorders of the fifth lumbar could be directly related to the sacral injury in one of three ways. They may have resulted from the same injury, or each may have been the result of separate injuries. We feel it is more likely, however, that the spondylolysis was a later development occurring as a result of the sacral deformity. This hypothesis is supported by the structure of the surfaces of the break. Whereas the sacrum had been totally remodeled, the surfaces of the break in the neural arches of the fifth lumbar indicate that the bone was in the process of healing, but had not totally remodeled itself to cover the cortex with lamina bone. It is therefore suggested that the spondylolysis was a result of an attempt by the vertebral column to compensate for the tilting of the sacrum. This would also account for the asymmetry of the break. This spon-

dyololysis may have been induced by an additional trauma of some sort or it may have just occurred naturally due to an active life-style in combination with advancing years (Merbs 1983: 35–42). According to Merbs, such a spondylolysis may not have severely limited mobility. It would have caused a slight sliding forward of the vertebral column, which would not have caused severe pain unless ligament damage was involved. Even if ligament damage had occurred, the individual may still have been able to walk or move about. Wear in the neural arches of the lumbar vertebra (as described below) reflects the sliding forward of the vertebral column, but the severity of the condition cannot be ascertained.

Osteoarthritis

The most severe examples of osteoarthritis were found in the vertebrae and lower torso of the individual. Lesser degrees of osteoarthritis were found in the ulnae, and on the articular surfaces of the clavicles, sternum, and ribs of the upper torso. Although some degree of osteoarthritis was expected considering the age of this individual, it is postulated that the advanced degree of remodeling activity found in the vertebrae and lower torso was, for the most part, directly related to the sacral and lumbar disorders.

Virtually every vertebra exhibits some degree of osteoarthritic lipping or vertebral osteophytosis along the superior and inferior margins of the centrum. Degenerative arthritis was also found in the vertebral column in the form of “bony spur formations” or osteophytes on the surface of the centrum in several elements (FIG. 7) (Ortner and Putschar 1981: 420–21; Steinbock 1976: 287–289). There is some evidence that fusion had begun around the margins of the centrum in the lumbar vertebra and this was also where osteophyte formations were the most extensive. Also in the lumbar vertebra, laminal spurs and areas of wear in the posterior superior portion of the neural arches, just below the superior articular process, indicate contact with the inferior articular process of the lumbar directly above it. This is particularly noticeable in the third lumbar where a set of wear facets had been created. Laminal spurs are more commonly reflective of osteoarthritis (Merbs 1983) but, as mentioned previously, the wear facets found here may be more indicative of a sliding forward of the vertebral column caused by the spondylolysis of the fifth lumbar (Merbs 1983: 35–42).

Summary

Burial 109 was that of a male, 35 to 40 years old at the time of death. He was fairly large-chested, and stood around 5'8" tall. Although he was a rather large individual, he was not very muscular. He was probably slightly anemic

as a child, and prior to his seventeenth year a fibrous cyst had begun forming in the basio-sphenoid suture of his occipital. Also prior to the age of 17, he received an injury to his sacrum that healed improperly and caused a tilting of the entire pelvic girdle. This may have forced him to walk with a slight limp and may also have accelerated osteoarthritic activity within the vertebral column and lower torso.

With advancing age, the strain imposed on the vertebral column by the sacral injury caused an asymmetrical separation or break in the neural arch of the fifth lumbar vertebra. This condition may have caused some discomfort, but may not have totally hampered mobility. It did cause a slight sliding forward of the vertebral column that is postulated to have further accelerated osteoarthritic activity. The skeletal remains do not provide evidence for terminal infection, fatal trauma, or any other possible cause of death.

The finely-ground macroscopic residues identified in the colon remains indicate that the dying man's food may have been specially prepared. Such finely ground materials are rare in American Southwest coprolite studies (Aasen 1984; Fry and Hall 1975; Moore 1978; Stock 1983; Williams-Dean 1978). This unusual food preparation suggests nursing care during his last days.

The analyses of the colon contents gave no clue regarding the cause of death. No parasites were found in the remains. The fact that the stool was present in the colon suggests dysentery was not a factor. A sudden death seems unlikely if, as the ground food suggests, there had been time to prepare food.

The colon content analysis probably reflect three aspects of prehistoric behavior relating to the care of the ill: food preparation, medicine, and ritual. The presence of small seed and corn fragments indicate the fine grinding of these materials, which were possibly added to a broth and consumed. The high percentage of *Salix* and Brassicaceae pollen probably reflects medicinal uses of these plants. Finally, the proportion of corn pollen in the soils surrounding the burial was exceptionally high, even for a midden deposit. This pollen may reflect the ritual preparation of the grave which possibly included the deposition of corn pollen or corn meal.

Conclusions

The potential for the recovery of demographic, socio-cultural, and ecological data from human burials has been realized only recently. Archaeologists in the past have been remiss in not consistently utilizing research designs and field methods that could maximize data recovery and make use of the full range of information available about past

populations through burial analysis. Proper recovery and analysis of human skeletal material requires the assistance of physical anthropologists and botanists who have interests and experience in osteological and ethnobotanical studies. Too often, these colleagues are either not consulted or are consulted only after the fact. In the case of Burial 109, a physical anthropologist (Marek) was on hand to assist in the conservation and removal of the skeletal and fecal material.

Sampling for pollen in the intestinal regions together with control samples taken from burial pit fill was a standard procedure in the NAN Ranch Ruin excavations. The background control sampling of the burial pit fill provided relevant data for the interpretation of the pollen samples from the coprolite.

There have been no reported cases in the American Southwest of colon contents being recovered from skeletal remains at an open site. While Burial 109 was but a single case in a large sample of burials from the NAN Ranch Ruin, it was significant. First, it yielded the only coprolite recovered from the site. Second, the find demonstrates that conditions exist in North American open-air sites in which desiccated colon contents may be preserved with burials. Third, the data from the burial have provided the first direct dietary information (at least for the dying) from coprolite analysis for the Mimbres. Fourth, the burial has yielded the first archaeological evidence of the use of medicinal plants. Finally, the data suggest special diet and care for an ailing individual during his final days. Although the osteological analysis did not reveal the cause of death, it did show that the individual probably suffered a chronic lower spinal condition that may have been painful and deteriorating, as well as mild arthritis. The data from Burial 109 on the health condition and dietary remains has added significantly to the growing body of information on the ancient Mimbres people.

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provided insight into *Salix* pollen deposition and ethnographic uses of *Salix*.

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