

PALEOPATHOLOGY ASSOCIATION
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SECTION I: WORKSHOP

OLDIES BUT GOODIES: CHALLENGING PATHOLOGY CASES FROM PAST WORKSHOPS. Organized by Donald J. Ortner and Bruce D. Ragsdale

In their fifteenth Paleopathology Workshop, Don Ortner and Bruce Ragsdale presented eight examples of skeletal disease, a mixture of modern and archeological cases. Most of these cases (the 'oldies') have appeared in previous workshops. The objective of the workshop was to highlight the diversity of skeletal disease and the diagnostic process and criteria used to make the most specific diagnosis possible. The emphasis was on pathological cases that provide a particular challenge in differential diagnosis and/or demonstrate important processes in skeletal pathology. After an initial brief introduction by Ortner and Ragsdale, workshop participants evaluated each of the cases and associated material (such as radiographs) and recorded their diagnosis. Following this phase of the workshop, Ortner and Ragsdale discussed each case and their conclusions about the differential diagnosis.

Several of the cases presented a reasonably straightforward single diagnosis: fluorosis, scalping, pituitary tumor, and sporadic hyperthyroidism (from tumor or iodine deficiency). Others were more problematic, including two crania with lytic lesions suggestive of multiple myeloma, metastatic carcinoma, or plasmocytoma. Two additional cases illustrated Ortner's adage, "a dog may have both ticks and fleas", one showing lesions consistent with both scurvy and anemia and the other apparently affected by both treponematosis and histoplasmosis.

SECTION 2: KEYNOTE LECTURE

PALEORADIOLOGY. Morrie E. Kricun, MD

Radiography of dry specimens is essential for the evaluation of the health status of ancient populations. It is often the examination of the radiograph that enables one to establish the correct diagnosis. Kricun reviewed the radiographic signs of diseases and, when applicable, correlated the radiograph signs with images of dry specimens. Topics covered include congenital anomalies and normal variants, congenital disorders, arthritides, spinal disorders (degenerative and inflammatory), infection (spinal and extremities), trauma, metabolic and endocrine disorders, and tumors. The importance of the radiographic evaluation when faced with certain findings on the dry specimens was discussed, as well as the importance of specific types of pathological lesions.

SECTION 3: CONTRIBUTED PAPERS

SLAYERS, SCRAPPERS, AND CABELLEROS: PATTERNS OF TRAUMA ON THE WEST GULF COASTAL PLAIN. Joan E. Baker

An analysis of trauma in skeletal samples from 28 sites from the West Gulf Coastal Plain demonstrated two general patterns. One of these, characterized primarily by projectile point injuries and bladed trauma, occurred in Archaic coastal and Late Prehistoric inland populations. A second pattern, exemplified by a predominance of blunt trauma to the face and head, was found in Late Prehistoric coastal populations and Historic inland groups. These patterns appear to be linked to interpersonal violence and activity levels. Intent of the attacker (kill versus disable) and motivation (defense or acquisition of resources versus personal disagreement) may influence the type of trauma resulting from interpersonal violence. Activities related to animal husbandry may also have played a significant role in Historic trauma patterns.

DOG DAYS: PALEOPATHOLOGY AND HUMAN COMPANIONS. Jodi Lynn Barta

Ancient DNA analysis offers the opportunity to pinpoint pathogens in ancient skeletal remains. Hyperpulmonary osteoarthropathy (HPOA) is a pathological condition recognizable in the skeletal remains of both humans and dogs. One of the causes of HPOA is tuberculosis. *Mycobacterium tuberculosis* complex DNA was extracted and amplified from the remains of a 15th century dog showing the pathological lesions of HPOA. The unique burial context and extent of skeletal pathology suggest that this dog may act as a proxy for studies of disease in its associated human population.

PATHOLOGICAL CASES FROM THE HUNNU PERIOD IN MONGOLIA. Naran Bazarsad

This paper describes pathological lesions in human skeletal remains from archaeological sites dating to BC 209- AD 93 in central Mongolia. The various pathological changes provide useful information about the nomadic living circumstances and may be indicators of the health conditions of Hunnu nomadic populations from the sites of Egiin Gol, Hutga Undur, and Arhangai aimag. The skeletal materials are curated at the Department of Anthropology, Institute of Archaeology of the Mongolian Academy of Sciences. Both sexes and all age categories are represented in the Egiin Gol and Hutga Undur samples. Many individuals suffered bone lesions, including signs of developmental anomalies, trauma, specific and nonspecific infectious diseases, porotic hyperostosis, DJD, and osteoarthritis. In the Egiin Gol and Hutga Undur samples, nonspecific infectious diseases are the most significant factor. The effects of nutritional deficiency and the traumatic lesions are consistent with their nomadic living circumstances.

CORRELATES OF LEPROSY IN MEDIEVAL DENMARK. Jesper L. Boldsen

Leprosy was a well-known and dreaded disease in the Middle Ages. Recent analyses indicate that a very substantial proportion of the population were infected by the causative agent, *Mycobacterium leprae*. Nearly one third of all adults died with osteological signs of leprosy in the seemingly unbiased population sample from Tirup (AD 1150 – 1350). It has been documented that people with severe malformations, particularly in the face, were moved to “lepers’ institutions” called Sct. Jørgensgårde. This paper analyses associated health problems and possible social stigma associated with milder expressions of leprosy in Medieval Denmark. It is shown that mild expressions of the disease did not directly affect the distribution of age at death; but this cannot be taken as an indication of lack of selective mortality for leprosy. However, even these milder manifestations of infection with *M leprae* were associated with place of burial and thus probably carried a social stigma.

A STUDY OF PAGET'S DISEASE AT NORTON PRIORY, CHESHIRE, ENGLAND, A MEDIEVAL RELIGIOUS HOUSE. Anthea Boylston and Alan Ogden

Norton Priory was established at Runcorn in Cheshire in 1115 AD during the reign of Henry I. It was a medieval religious house whose inhabitants were canons following the rule of St Augustine. Most of the 120 burials excavated during the 1970s were those of older males; a few were elderly females who, as benefactresses of the establishment, had the right to be buried within the church precinct. Several of these individuals showed evidence of Paget's disease which, incidentally, is more common in this part of England at the present day than it is in any other part of the country. Paget's disease is a disorder of bone metabolism and affects about 5% of people over 50 in the UK today, involving most commonly the skull, spine, pelvis or femora. Palaeopathological cases are rare. Three cases from Norton Priory are described and the aetiology of the disease is discussed.

COMPASSIONATE NEANDERTHALS?: COMPARATIVE STUDIES OF PRIMATE SKELETAL PATHOLOGIES. David DeGusta

The pathological Aubesier 11 Neanderthal partial mandible has been interpreted by Trinkaus and colleagues as evidence that Middle Pleistocene hominid populations, “had achieved a level of sociocultural elaboration sufficient to maintain debilitated individuals and to provide the motivation to do so.” This hypothesis is tested here by comparing the pathological processes seen in the Aubesier 11 hominid specimen with those evident in wild non-human primate skeletal material. A variety of wild non-human primates have similar pathological processes of equal or greater severity than that seen in Aubesier 11. There is also no evidence of any condition in Aubesier 11 which would have prevented that individual from providing for himself/herself. Therefore the Aubesier 11 partial mandible cannot be taken as evidence for an increased level of conspecific care in Middle

Pleistocene hominids, despite the claims of Trinkaus et al. This illustrates the importance of a comparative approach to paleopathology.

MOLECULAR DIAGNOSIS OF PREHISTORIC TRYPANOSOMA CRUZI IN THE TEXAS-COAHUILA BORDER REGION. Katharina Dittmar, Ana Maria Jansen, Aduino Araújo, and Karl Reinhard

Reinhard et al. (2003 <<http://memorias.ioc.fiocruz.br/19pback.html>>) reported a case of megacolon in an mummy known as SMM who died approximately 1,150 years ago in the Rio Grande Valley which forms the modern border between Coahuila, Mexico and Texas, USA. Megacolon is one pathology related to Chagas Disease which is caused by *Trypanosoma cruzi*. These authors called for the molecular investigation of the SMM remains to definitively diagnose Chagas Disease. We report on the results of the molecular analysis of the SMM. We succeeded in recovering ancient *T. cruzi* DNA. This verifies that Chagas Disease was a prehistoric health threat in the region.

A PROBABLE CASE OF ANENCEPHALY WITH CRANIORACHISCHISIS IN PIONEER UPPER CANADA: QUALITATIVE AND QUANTITATIVE OBSERVATIONS. Christopher J. Dudar

Recent interest has been raised regarding the paleopathological identification of anencephaly (Miller and Simon, 2001, PPN No. 115). This paper presents qualitative evidence and quantitative procedures used to diagnose anencephaly in an archaeologically recovered fetal skeleton. Burial 492, a 9-9.5 lunar month gestation fetus, yielded no cranial vault bones despite an undisturbed mortuary environment and good preservation of other skeletal elements. Osteometric data collected from B.492 and seven other anencephalic fetal remains at the Smithsonian Institution were contrasted with Fazekas and Kósa (1978) fetal standards. Consistent differences were not discovered for simple metric comparisons to the standards. Comparisons involving the proportions of basi-cranial elements yielded diagnostic pattern deviations possibly related to growth abnormalities. Burial 492 clusters within the pattern of documented anencephalics, and when combined with other qualitative observations of malformations of the spinal column (craniorachischisis), provides compelling evidence for the diagnosis of the second case of anencephaly in the paleopathology literature.

A NATURALLY MUMMIFIED FETUS FROM ROMAN PERIOD EGYPT. Tosha L. Dupras, Tracy Beach, Matthew W. Tocheri, J. Eldon Molto, and Peter Sheldrick

In 1993 a naturally mummified fetus, provisionally dated to around A.D. 350, was discovered during the archaeological excavations of Kellis, an ancient Roman period village site located in the Dakhleh Oasis, Egypt. The fetus, which appears to have been spontaneously aborted, was uncovered wrapped in linen on the rooftop of a house. Skeletal measurements taken on the actual specimen as well as from radiographs indicate

the fetus was approximately 15 gestational weeks and may represent the youngest mummified remains ever found. In this paper, we discuss the cultural treatment of these remains and explore possible causes of premature fetal expulsion. The presence of abnormal morphology suggests that this individual may have suffered from neural tube defects, particularly anencephaly and spina bifida cystica. Differential diagnoses are based on morphological assessment, radiographs, and CT scans, and include a consideration of taphonomic processes.

PRELIMINARY RESULTS FROM A RENEWED INVESTIGATION OF THE HUMAN SKELETAL REMAINS FROM THE BATTLE OF VISBY IN 1361.

Ebba M. Doring, Marie Flemstrom, Jessica Larsson, and Peter Akeson

The material represents commingled skeletal remains of combatants who died in the battle between Danes and Gotlanders which took place in 1361, outside the wall of Visby on Gotland. The Gotlanders were buried at Korsbetningen in common graves, containing some 1800 individuals. The excavations and investigations of the graves began in 1905 and continued in 1912, 1928 and 1930. Our new investigation deals with the remains from Common Grave 3, representing at least 119 commingled individuals. A database was created and an attempt will be made to assign the different skeletal elements to single individuals using computerized criteria. Assessment of sex and age, calculations of stature, skeletal and pathological changes and microanalytical analyses are planned. The evidence of injuries received in the battle on cranial as well as postcranial skeletal elements is extensive.

RECONSTRUCTION OF KUMEYAAY LIFEWAYS: DETERMINING THE VALUE OF ETHNOHISTORIC VERSUS ARCHAEOLOGICAL EVIDENCE. Tori D. Heflin

Understanding the Kumeyaay, the indigenous people of San Diego County, relies on biological, archaeological, and ethnohistoric records. In particular, paleopathological investigation offers significant insight into the past lifestyles of the Kumeyaay. However, due to NAGPRA (Native American Graves Protection and Repatriation Act) legislation, many collections of skeletons and material culture are being repatriated from museums and other institutions. Without these collections, it may be necessary to rely solely upon ethnohistoric resources to deduce information about the lifestyle of past populations. The purpose of this project was to determine when and where ethnohistoric and archaeological records give complementary and/or contradictory information. Without skeletal remains, will we be able to get the same information about past Kumeyaay lifestyle from the ethnohistoric record? As evidenced by the analysis of the Kumeyaay skeletal remains, the archaeological record does seem to confirm the ethnohistoric accounts in this region. However, the information gathered from all of these sources contributes to a clearer understanding of the Kumeyaay past.

PUTTING THE "PALEO" BACK IN PALEOPATHOLOGY. Vance T. Hutchinson

It is interesting that any cursory search of the paleopathological literature will turn up little organized information about pathology in fossil human remains. Most, though not all, paleopathological research can be sorted into three basic types: 1) population health status derived from archaeological and historic cemeteries, 2) accounts of specific cases that are used to trace the evolution of a given disease, and 3) earliest or extreme expression of a given disease. No one has researched and evaluated the possibility of a methodological dichotomy between doing bioarcheological (i.e., more recent) and fossil human paleopathology. This study explores the types of paleopathological descriptions available in the literature and provides a preliminary catalogue of pathological fossil specimens. Types of information that can be elucidated from fossil paleopathological material are discussed. The rarity of fossil human specimens makes the study of their pathologies important in human evolutionary studies.

COMPARISON OF LONG BONE FRACTURE PATTERNS IN EARLY MEDIEVAL POPULATIONS IN ENGLAND AND GERMANY. Tina Jakob

Patterning of long bone fractures helps assess possible environmental hazards and interpersonal violence in skeletal populations. In the present study, 5733 well-preserved adult long bones were present for examination. They were recovered from six early medieval (5th-7th century AD) cemeteries, three located in England and three in southwestern Germany. The overall fracture rate of less than 1 percent (n=54) was comparatively low, although skeletons from the German sub-sample showed a significantly higher frequency than the English individuals. Males from both countries suffered from more traumatic injuries, indicating a more perilous way of life, but females were not entirely spared. The clavicle was the skeletal element that displayed the highest fracture frequencies in both sexes and both countries. Differences occurred when upper and lower limb fractures between the two countries were compared. The observed fracture patterns are discussed with cultural contextual factors that may have influenced the patterns seen.

PALEOPATHOLOGICAL ANALYSIS OF TWO HISTORIC MUMMIES FROM SOUTHERN NEVADA. Gwyn D. Madden and Bernardo T. Arriaza

These are two partially mummified individuals, male and female, now housed at the University of Nevada, Las Vegas. They were collected by law enforcement personnel from two locations in Southern Nevada. Visual observation and radiography analysis were performed in the detection and diagnosis of those pathological conditions present. The male presents such pathologies as a small healed fracture, a number of degenerative dental conditions, significant arthritic modification, and a bowed fibula. The female presents similar degenerative dental conditions, and osteoarthritis secondary to osteoporosis with severe erosion of the sacro-iliac region. These historic mummies offer a great deal of knowledge about life and health in the mid to late 1800's in Southern Nevada. The arthritic changes seen in both individuals portray a life of hard labor

compared to today's standards, for both men and women. In addition, associated artifacts show possible treatments available during this period.

DEGENERATIVE JOINT DISEASE IN TWO BRITISH MEDIAEVAL POPULATIONS. Simon Mays

At a synovial joint, although the presence of eburnation and porosis are generally (if not universally) accepted as indicative of osteoarthritis by palaeopathologists, the status of marginal osteophytes, particularly when they occur at otherwise normal joints, is more controversial. In an attempt to investigate the significance of the presence of periarticular osteophytes at otherwise normal joints, periarticular osteophyte formation and joint surface changes (porosis, eburnation) were recorded in two Mediaeval skeletal series. The inter-site patterning in the prevalence of marginal osteophytes at otherwise normal joints differed markedly from that for the joint surface changes. The findings are interpreted in the light of what is known about the disease experience of these groups from previous studies on these remains, and in the light of what is known, or can reasonably be inferred, about differences in the levels of physical activity. The significance of the results for the way in which degenerative joint disease is recorded in osteological material is also discussed.

BASIC MECHANISMS IN SKELETAL REMODELING IN FACE OF DISEASE. Bruce D. Ragsdale

Whichever of the Seven Basic Categories of Disease afflict the skeleton, inherent remodeling and reparative mechanisms respond to preserve optimal functional integrity. Pathologic modification of the skeleton is induced by three influences only – circulation, metabolic factors, and mechanical stress. While the resultant structural modification may be major deformity or even a grotesque caricature of normal, functional mobility and reproductive opportunity may yet be met. It is important to disentangle compensatory reaction and repair from the more specific hallmarks of disease in a specimen. Wolff's law may be summarized as "Every change in the function of a bone is followed by certain definite changes in internal architecture and external conformation in accordance with mathematical laws." Dr. Putschar often spoke of the "reverse Wolff's law", meaning "in the face of disease, the body gives up the most expendable skeletal components, conserving the essential". Case examples illustrate this theme.

DENTAL DISEASE FROM PREHISTORY TO THE POST-MEDIEVAL PERIOD IN BRITAIN: FREQUENCY AND PALAEOEPIDEMIOLOGY. Charlotte A. Roberts and M. Cox

The evidence for dental disease is considered from agriculturally based rural and urban Neolithic to post-Medieval British archaeological sites. Primary collected data as well as published/ unpublished skeletal report data were consulted; over 35,000 individuals were

represented. Caries rates for the prehistoric periods were: Neolithic 3.3%, Bronze Age 4.8%, Iron Age 2.9% and Historic periods: Roman 7.5%, early Medieval 4.2%, late Medieval 5.6% and post-Medieval 11.2%. Abscess rates were: 3.8%, 11.0%, 1.1%, 3.9%, 2.8%, 3.1% and 2.2%, respectively. Antemortem tooth loss rates were: 6.1%, 13.2%, 3.1%, 14.1%, 8.0%, 19.4% and 23.4%. Frequencies for caries and antemortem tooth loss are low until the late Medieval period. Dental disease declines in the Early Medieval period compared to the Roman period; rates rise in the Late Medieval period. Diet/economy, trade, oral hygiene and fluoride are explored as possible epidemiological factors in the frequencies.

A NEW APPROACH IN PALEOANTHROPOLOGY: THE DISEASES OF OUR ANCESTORS. Michael Schultz and Tyede H. Schmidt-Schultz

Selected samples of fossil bones from various sites (e.g. Dmanisi, Saldana, Eliye Springs, Neander Valley [Neanderthal], Vindija,) were examined by light microscopy using plane and polarized light and endoscopy to diagnose vestiges of diseases. The histomorphological and endoscopic findings show that microscopic and endoscopic research adds much to what can be seen macroscopically or by X-ray techniques including computerized tomography (CT). In particular, emphasis was placed on the causes of inflammatory diseases of early hominoids. As knowledge of the etiology and epidemiology of diseases in early humans enables us to contribute important information to reconstruct ancient living conditions, such as nutrition, housing and working conditions and hygiene, the paleopathological investigation of fossil human bones should be included as a routine examination.

HEALTH AND THE EMERGENCE OF CHIEFDOMS: THREE OSSUARY SITES FROM PISCATAWAY PARK, MARYLAND. Sara K. Simon

Health conditions among natives in the Chesapeake Bay area were viewed over time to determine the effects of the formation of an agricultural chiefdom on the health of aboriginal populations. The focus of this study is three small ossuary sites from differing time periods (Middle Woodland through Protohistoric) located in Piscataway Park, Maryland. Nonspecific indicators of health were used to evaluate the wellbeing of these various peoples. Preliminary data support an increase in infectious disease, linear enamel hypoplasias, and dental pathologies such as caries, abscesses, and antemortem tooth loss. By contrast, there was very little porotic hyperostosis, cribra orbitalia, or trauma observed in these collections. These data support a decline in community health over time due to various cultural and environmental factors occurring with the emergence of complex societies in the Tidewater-Potomac area.

THE IDENTIFICATION OF FETUSES IN THE SKELETAL RECORD. Patricia Smith

The accuracy of age estimations is especially critical in the case of infant death where the distinction between miscarriages, stillbirths and neonatal death may have forensic implications quite apart from its relevance for interpreting past health and cultural practices. Skeletal criteria are still those most commonly used, although there is general agreement that dental development shows a better correlation with chronological age as well as providing additional information on developmental disturbances and postnatal survival. Published reports of infants from archaeological sites often include reference to “fetuses” buried in the same way as older infants. Comparison of the age estimations from such sites with (a) epidemiological data on gestational age and birth weight and (b) recent findings on intrauterine development based on ultrasonic findings, indicates that most if not all such “fetuses” may have been born alive and were potentially viable. The use of the term “fetal” to describe such infants is therefore misleading.

THE MIDDLE NEOLITHIC PEOPLE FROM TREBUR (GERMANY). Wolf-Rüdiger Teegen, Kerstin Kreutz and Manfred Kunter

In the early 1990s, a complete cemetery of the Middle Neolithic Hinkelstein and Grossgartach culture was excavated, containing 137 skeletons. They were studied anthropologically by a team from Giessen university, lead by M. Kunter. Recently, the badly preserved skeletons were re-examined from a paleopathological point of view. This paper gives a preliminary report on these studies. Dental caries and parodontopathies were common, as well as linear enamel hypoplasia. Possibly, the teeth were used as tools. Degenerative joint diseases and myotendopathies were indicating high physical stress of both males and females from Trebur. A possible case of ankylosing spondylitis was also present.

PALEOPATHOLOGICAL DESCRIPTION AND DIAGNOSIS OF COCCIDIOIDOMYCOSIS IN HUMAN SKELETAL REMAINS FROM ARCHAEOLOGICAL SITES IN THE AMERICAN SOUTHWEST. Daniel H. Temple

Coccidioidomycosis is a fungal disease that produces lytic skeletal lesions in 20-50% of disseminated cases. Numerous radiological examples of coccidioidomycosis are reported in pre-antibiotic clinical literature. However, this condition is rarely reported as a specific diagnosis in archaeological skeletal material recovered from within or around endemic regions, possibly due to a lack of reference material or the variation in lesions produced by coccidioidomycosis. Despite such caveats, this study finds that overall lesion distribution, biocultural data, and endemic information can be used to exclude conditions that produce similar lesions including tuberculosis, metastatic cancer, brucellosis, blastomycosis, and cryptococcosis, while suggesting coccidioidomycosis as a specific diagnostic option. This study examines the remains of 263 individuals from archaeological proveniences within and around areas in which coccidioidomycosis is endemic. One probable case of coccidioidomycosis is described, while another is rejected using a tentative diagnostic model. The diagnostic model relies on lesion distribution, biocultural data, and endemic information.

THE NEED FOR MULTIPLE NUTRIENT HYPOTHESES IN THE REALM OF NUTRITIONAL ANEMIAS. Tanya E. von Hunnius

In the past decade, investigation of paleonutrition from skeletal remains has focused intently on the identification of single nutrient deficiencies (e.g., iron deficiency anemia and scurvy). While this approach has resulted in some important insights, the narrow focus needs to be addressed. The investigation of nutrient sources, metabolism and physiological roles reveals that interrelationships are the norm. For the purpose of this study, the synergism between iron, vitamin C, folic acid and vitamin B12 is discussed with special attention to the role of these nutrients in hematopoiesis. Examples from the Mississippian Period (A.D. 900-1500) skeletal collection from Dickson Mounds, Illinois show that pathological lesions indicative of several nutritional deficiencies can be observed on one individual. By using these results as a stepping stone, paleonutritionists should ultimately be aware that a more complicated picture of nutritional anemias exists: many nutrients are synergistic and deficiencies of isolated nutrients are extremely rare.

SECTION 4: POSTER PRESENTATIONS

DENTAL PALEOPATHOLOGY FROM MONGOLIA. Naran Bazarsad

The study of dental pathology is of more than historical interest. This study reports several nonmetric dental traits (including mandibular and palatine tori) and dental disease in the Hunnu period (BC 209- AD 93) in Mongolia. The skulls are housed in the collection of the Department of Anthropology, Institute of Archaeology and Biology of the Mongolian Academy of Sciences. The demographic profile of the Hunnu period samples consist of 56 males, 27 females, and 17 juveniles-infants.

DEAD MEN BREATHING: THE PREVALENCE OF INTRATHORACIC AND EXTRATHORACIC PULMONARY PALEOPATHOLOGIES AMONG 83 CHACHAPOYA MUMMIES. Ronald Beckett, Anthony J. Bravo, Gerald Conlogue, and Sonia Guillén

A radiographic and endoscopic examination was conducted on 83 Chachapoya mummies from the Laguna de Las Condores site near Leymebamba, Peru. The mummies were examined at the Centro Mallqui research facility in Leymebamba using portable radiographic and endoscopic technology. Among the paleopathologies demonstrated were calcified intrathoracic lesions, pleural adhesions, and extrathoracic cervical lymph node lesions, possibly evidence of scrofula. Additionally, a rare air bronchogram of a trachea and main stem bronchi was also demonstrated. The prevalence rate for each pathology is presented. These data are compared with previously reported spinal lesions suggestive of tuberculosis.

PALEOPATHOLOGICAL INVESTIGATION OF A SAMPLE OF INCA BURIALS: A BIOARCHAEOLOGICAL APPROACH. Trisha Biers

Just outside the city of Lima in the Rimac Valley lies one of the largest Inca cemeteries ever to be excavated in Peru. Thousands of burials, including preserved mummy bundles, have been found beneath the village structures in the community of Tupac Amaru. The Peruvian Institute of Culture requested an evaluation of the area and the Puruchuco-Huaquerones Salvage Project was developed. The preliminary bioarchaeological results of a sample of unique burials from the cemetery will be presented here. Stemming from these results is the question of the relationship between health and social status. Looking at the paleopathology of the individuals in the sample and their burial offerings has indicated that there is in fact a possible connection between them. One particular individual from the sample will be highlighted due to the extreme nature of the skeletal abnormalities and the elaborate associated artifacts.

EXPLORING THE MYTH AND PALEOPATHOLOGIES OF MUMMIES FROM A TURKISH TOMB. Anthony J. Bravo, Gerald Conlogue, Ronald Beckett, and Larry Engel

Radiographic and endoscopic examination was undertaken to determine the validity of a Turkish legend surrounding a collection of seven mummies in Amasya, Turkey. The presence and extent of Paleopathologies was also examined. The legend states that one of the mummies was a governor of the area and killed by the Mongols. Another mummy was said to be the governor's concubine, and three infant and child mummies were said to be their children. Non-destructive analysis of this collection refuted some key features of the legend and revealed several interesting paleopathologies including a healed fractured hip, arthritic changes, severe dental attrition, and growth arrest lines on one of the children.

A PALEOPATHOLOGICAL EXAMINATION OF EIGHTEEN MUMMIES FROM THE CHURCH OF THE DEAD, URBANIA, ITALY. ANTHONY J. Bravo, Gerald Conlogue, Ronald Beckett, Anja Staskiewicz, Larry Engel and Sarah McGann

A radiographic and endoscopic analysis was conducted on eighteen natural mummies on display in the Church of the Dead, Urbania, Italy. The mummies, which had been exhumed from a cemetery adjacent to the church, date from the 17th to 19th centuries. Examination revealed a variety of paleopathologies. Among the pathologies demonstrated were congenital dislocation of the hip, congenital scoliosis, severe kyphosis, small and large bladder stones, arthritic changes, and pulmonary pathology. Whipworm eggs were recovered from a coprolite sample removed from one mummy.

THIRD MOLAR, JAW LENGTH AND TMJ PATHOLOGY. Starletta C. Brown
(Winner, Cockburn Student Competition, 2003)

Evidence for temporomandibular joint (TMJ) dysfunction has been observed in prehistoric and modern populations. Functional stresses on the jaw may result in mandibles that do not reach maximum phenotypic development. The third molar, which develops after the jaw has completed its growth, does not have sufficient space to erupt properly in a shortened jaw, thus resulting in impaction, anterior tooth crowding, and malocclusion. Because the masticatory system functions as a complex whole, changes in the dentition can lead to remodeling and pathology of the TMJ. Mandibular and cranial measurements were recorded on 105 individuals between the ages of 20-35 in a 20th century skeletal population, the Hamann-Todd Collection, located at the Cleveland Museum of Natural History in Cleveland, Ohio. The results of this study provide evidence that there is a significant relationship between jaw growth, the third molar and TMJ pathology.

TWO CASES OF PELVIC OSTEOCHONDROMA IN NEW KINGDOM NUBIA.
Michele R. Buzon

Osteochondroma is one of the most common bone tumors found in clinical cases. These tumors usually occur on the metaphyseal surfaces of the limbs, appearing as a projection of bone with a core of trabeculae continuous with the metaphysis. Approximately 80% of osteochondromas are found on one of the limbs. Only about 5% of cases are located on the pelvis. This study examines two cases of single osteochondroma on the os pubis from Tombos, a New Kingdom period cemetery in ancient Nubia. The first individual is aged 40-55 and the second is aged 55+; both are male. On both individuals the osteochondroma appears on the anterior aspect of the right pubis, projecting anteriorly approximately 7cm on the first and 5cm on the second individual. As the only two cases of osteochondroma in this relatively small skeletal sample (MNI=128), it is remarkable that these tumors are found in this unusual location.

THE GEOGRAPHICAL DISTRIBUTION OF CARIES IN EARLY AND LATE
MEDIEVAL BRITAIN. Anwen C. Caffell

Early medieval populations in Britain tend to have a low prevalence rate of caries, and this is often interpreted as being due to the coarse diet lacking in refined sugars. In contrast, caries rates rise in the later medieval period coinciding with the introduction of imported refined sugar. Apart from diet, levels of fluoride in the water, dental hygiene practices and the age profile of the population will also influence caries prevalence. This poster examines the geographical distribution of caries in early and late medieval Britain using data compiled from published and unpublished skeletal reports. The data considered are taken from 80 sites throughout Britain, though most are concentrated in the south and east of England. Spatial patterns for the two periods are compared and

explored with reference to possible influencing factors. Data are discussed with respect to their limitations.

THE DENTITION OF THE EARLIEST SETTLED VILLAGERS IN JALISCO, WEST MEXICO: ASSESSING MAIZE CONSUMPTION. Laura Cahue, Susan MacPeek-Rodriguez, and J.B. Mountjoy

The dental remains of seventy individuals from the site of El Pantano, in the highlands of western Jalisco, were analyzed to evaluate levels of maize consumption. We scored frequencies of dental caries, AML, and patterns of occlusal wear. The dental data were compared to stable isotopic evidence from bone collagen. These individuals represent the earliest settled villagers to inhabit major portions of Jalisco, an event radiocarbon dated to ca. 800B.C. that fills the gap between the Capacha and Shaft Tomb archaeological cultures. The archaeological evidence for maize consumption is problematic. Given the assumption that maize cultivation was important for development of settled village life during the Formative Period, it is important to assess maize consumption by these people.

THE PALEOPATHOLOGY OF A MUMMIFIED ARM AMONG THE “BIG FOUR”, A COLLECTION OF NATURAL MUMMIES IN SAINT MICHAN’S CHURCH, DUBLIN, IRELAND. Larry Cartmell, Gerald Conlogue, Ronald Beckett, and Peter Condell

A radiographic and endoscopic examination was conducted on four natural mummies on display in the crypts beneath Saint Michan’s Church in Dublin, Ireland. The best preserved mummies are known as “the big four”. A disarticulated arm was present in the coffin of the mummy known as ‘the nun’. It was determined that the arm did not belong to the ‘nun’ as sections of the elbow joint were present on both the detached arm and the humerus which remained attached to the mummy. Radiographic analysis of the arm demonstrated multiple lesions which appeared calcified. Paleopathological examination demonstrated a possible case of severe Calcaniosis Cutis.

PERIMORTEM TRAUMA OR PSEUDOPATHOLOGY. Mark Nathan Cohen and Della Collins Cook

Fragments of a juvenile skull found inside the 16th Century Visita mission excavated at Tipu, Belize are presented. The skull was part of a secondary mix of individuals disturbed by subsequent inhumations. The skull displays series of perforations clearly extending from the outer table inward accompanied by retained, (in place) fragments of the perforations on the endocranial surface. A second feature setting the skull fragments apart from other bones in the cemetery is the presence of a thin layer of caliche that may suggest that the skull was first buried in another location.

ANNA OF KASTL, GERMANY: AN EVALUATION OF THE PRINCESS MUMMY.
Gerald Conlogue, Ronald Beckett, Anthony J. Bravo, Ronald Martin, and Mary Olive Smith

Elaborate and romantic stories are frequently associated with mummified remains that are on display. The present study utilizes radiography and endoscopy to examine the legend and facts regarding Princess Anna in Kastl, Germany. Although the child could not be removed from the display cabinet built in 1715, equipment was modified and data were collected regarding the age at time of death, state of preservation, and paleopathologies.

INCIDENCE OF EXTERNAL AUDITORY EXOSTOSES AMONG THE WISHRAM AND WASCO TRIBES OF THE COLUMBIA RIVER VALLEY. Kristin E. Horner and Gerald Conlogue

The purposes of this study were to review existing literature regarding the formation of external auditory exostoses in past and present populations, to clarify the definition of external auditory exostoses, to evaluate the prevalence and severity of this pathology in the Wishram and Wasco tribes, and to examine the implications of the findings. One hundred and fifty-six adult skulls were examined and exostoses were graded to reflect severity. The overall frequency was found to be 32.7%, with a frequency of 48.6% in males and 19.0% in females. No evidence of exostoses was found in the thirty child and adolescent skulls examined. These findings are consistent with a subsistence pattern involving a heavy reliance upon fish from the Columbia River with adult males doing much of the fishing.

THE GREGG COLLECTION: ARCHIVAL RESOURCES IN PALEOPATHOLOGY.
Ellen Ireland, Robin M. Lillie, and Shirley J. Schermer.

Dr. John B. Gregg donated to the University of Iowa Office of the State Archaeologist his vast collection of notes, correspondence, articles, books, slides, photographs, x-rays, films, and videos spanning his 30 year career. A retired physician from South Dakota, Dr. Gregg has had a long-time active interest in physical anthropology and paleopathology. The extensive listing of his published articles in the *Human Paleopathology* bibliography includes *Dry Bone: Dakota Territory Reflected*, a book on paleopathology of the Middle Missouri River region he authored with his wife Pauline Snyder Gregg. Through Gregg's involvement with work at numerous important sites in South Dakota, such as Crow Creek, osteological data from burials at these sites are documented in this collection. The archival materials provide valuable research and teaching resources for those interested in osteology and paleopathology in general.

A STAFNE DEFECT IN AN OLDER NASCA MALE FROM PREHISTORIC PERU.
Corina M. Kellner

A developmental salivary gland defect was found on the inferior border of the left mandibular body in an older adult male from the Nasca culture (AD 1-750) of prehistoric southern Peru. In its location, size, and shape it most closely resembles the Stafne defect, as opposed to other lesions in this region such as dental abscesses and pathologic cysts. Recent hypotheses suggest that this defect is correlated with an enlargement of the salivary gland and a concomitant increase in the production of immunity-enhancing factors that help combat parasites and protect the alimentary tract. Inadvertent contamination of the Nasca water supply in a harsh desert environment might have selected for individuals with larger salivary glands in order to combat high parasite loads. This finding adds to the literature regarding this defect and helps to illuminate its geographic and cultural spread.

DEAD MEN SMILING: A RADIOGRAPHIC SURVEY OF CHACHAPOYA TEETH.
Gus Karazulas, Anthony J. Bravo, Gerald Conlogue, and Sonia Guillén

A total of 205 mummies recovered from Laguna de Las Condores were radiographed over a two-year period at a field laboratory established in Leymebamba, Peru. In the early stages of the project, the primary focus of the radiography was to document the contents of each bundle. Since specific radiographic projections were not always obtained, an evaluation of the dental condition was possible for only 177 of the mummies. Where possible, age at time of death, presence of carries and abscesses, the degree of bone resorption and tooth loss was noted.

TREPHINATION FROM BRONZE AGE TROY: A CASE REPORT. Henrike Kieseewetter

This report contributes to the knowledge of trephination in the Eastern Mediterranean region. In 2001 a richly endowed Late Bronze Age burial of a male adult was recovered within the Troia VI settlement. The skull exhibits a trephination on the right parietal bone, making this the first case of cranial 'surgery' reported from prehistoric Troy. It must be noted that the trephination was performed by cross-cut sawing, an ancient technique which is frequently found in pre-Columbian Peru but rarely in the Old World. Another striking observation is best seen on the CT scan of the cranial vault. The endocranial surface shows an erosion of approximately 3 cm in diameter close to bregma. It is most likely that the lesion was pathological, pointing towards a benign tumor. However, it is not clear whether there is any relation between the detected pathology and the trephination.

TREPHINATIONS FROM OMAN: DIFFUSION OR NOT? Judith Littleton and Bruno Frohlich

Trephination has been widely reported among prehistoric human remains. It has been suggested that the practice is subject to cultural diffusion. This paper addresses that

suggestion in the light of two trephined skulls from the Oman Peninsula dating to the Late Bronze Age. Both calvaria demonstrate trephinations across the parietals. Cranium 1 had a total of 9 trephinations that were achieved by scraping the bone surface to produce an oval shaped perforation of the skull. Two of these trephinations show indications of possible healing. Cranium 2 had four perforations also primarily on the parietals, but only one has possible bone remodelling. While these trephinations are similar to others in the region (from North India and from Palestine), the practice did not diffuse to nearby Bahrain. Comparisons are drawn with ethnographic studies that indicate trephination is not necessarily a practice that is readily diffused.

BACK BREAKING WORK?: A STUDY OF SPONDYLOLYSIS OBSERVED IN LATE WOODLAND AND MISSISSIPPIAN COMPONENTS FROM WEST CENTRAL ILLINOIS. Laura D. Marciano

Spondylolysis, a fracture that separates the spinous portion of the neural arch from the rest of the vertebra, was examined in Late Woodland (N=85) and Mississippian (N=174) individuals excavated from the Schild mound group, located in west central Illinois. 11.8% (10/85) of the Late Woodland sample and 13.8% (24/174) of the Mississippian sample had spondylolysis. The difference in frequency of spondylolysis between components is not significantly different, indicating that both populations participated in comparable repetitious physical activities that strained the lower back in near equal amounts. A feature that is of importance and is unique to the Schild mound group's Late Woodland and Mississippian components is the similar incidence of spondylolysis in males and females. This signifies that instead of sexual division of labor being shifted towards males, as seen in many other studies of archaeological samples, these repetitious physical activities were practiced almost equally by males and females.

A POSSIBLE CASE OF RENAL OSTEODYSTROPHY FROM MEDIAEVAL WHARRAM PERCY, ENGLAND. Simon Mays

A skeleton of an adolescent male shows sub-periosteal and endosteal new bone formation. Differential diagnoses include fibrous dysplasia and metastatic cancer, but it is suggested that the diagnosis most consistent with the lesions is renal osteodystrophy.

TREPONEMAL INFECTION AMONG AN EARLY MANITOBA BOREAL FOREST POPULATION (CA 2000 BP): EVIDENCE FROM THE WHALEY CAIRN (EbKx-10). Deborah C. Merrett, Todd Garlie, Chris Meiklejohn, Linda Larcombe, Bruce M. Rothschild, and Brett Waddell

Evidence for treponemal infections in New World populations is limited. Skeletal remains recovered in S.E. Manitoba from the Whaley Cairn (EbKx-10) (ca 2000 BP) present with periosteal lesions that are indicative of reaction to disease. Distribution of these lesions suggests a clear association with a treponemal infection, though a clear

diagnosis is not available at this time. The Whaley Cairn is unique in that a high proportion of the recovered individuals, both adult and subadult, present with such periosteal reactive bony lesions. This poster is part of a continuing effort to understand the health and well being of early Manitoba populations.

PALEOPATHOLOGY OF THE NORTON MOUNDS MIDDLE WOODLAND SITE FROM KENT COUNTY, MICHIGAN. Kimmarie A. Murphy

In general, Michigan lacks an abundance of prehistoric skeletal material and hence analyses of Middle Woodland skeletal material from Michigan are limited relative to the volume of data from sites in Illinois and Ohio. In an effort to remedy this situation, individuals from the site of Norton Mounds are examined. Based on the archaeological associations, the site dates to approximately 2000 B.P. The dental remains of adults are characterized by extensive tooth wear, defects of dental enamel, and occasional caries and abscesses. Juveniles also exhibit extensive wear but lack any other dental pathologies. Degenerative changes among adults are common, particularly in the vertebral column. Cribra orbitalia is prevalent among the juveniles. Several juveniles exhibit postcranial proliferative lesions. The observed health patterns from this study contribute to a more comprehensive understanding of life in prehistoric Michigan and allow for further comparisons with other Middle Woodland populations in the region.

TALLOW HILL CEMETERY, WORCESTER, ENGLAND: THE IMPORTANCE OF DETAILED STUDY OF POST-MEDIEVAL GRAVEYARDS. Alan R. Ogden and Anthea Boylston

With the dramatic increase in the population of England in the early nineteenth century, burials began to take place in new large urban cemeteries including Tallow Hill, Worcester, in the English Midlands. Established in 1792 along with a workhouse, it was situated in an industrial part of the city near to the Vinegar Works and the Vulcan Iron Works. This poster reports on a corner of this graveyard, recently excavated prior to development. Remains of ten individuals were recovered, principally from two brick-built vaults. Two juveniles have already been identified from written records, and it is hoped that some of the adults may also be identified. These remains present a disproportionately wide range of anthropological, developmental and pathological problems, which are presented for consideration. Skeletal remains from Victorian England provide a precious opportunity to examine the reality behind the world of George Elliot, Mrs. Gaskell and Charles Dickens.

THE NEW WORLD OF ANCIENT PARASITIC DISEASE. Karl J Reinhard, Jason McGuire, Marcelo Luiz Carvalho Gonçalves, and Aduino Araújo

Recent papers summarizing the state of archaeoparasitology highlight the diversity of ancient parasites (<<http://memorias.ioc.fiocruz.br/98sup.html>>). Most important is the

documentation of protozoa, acanthocephalan, trematode, cestode, nematode, and arthropod parasites in the prehistoric New World. The cumulative findings of three decades of research show that parasite infection was a common aspect of life. This presentation summarizes the known geographic range of prehistoric parasites in the Americas with special focus on where parasite infection caused disease.

CEPAHALOMETRIC EXAMINATION OF THE MUMMY “RAMESES I” FROM THE MICHAEL C. CARLOS MUSEUM OF EMORY UNIVERSITY. Russell T. Reynolds and James E. Harris

In 2000 an Egyptian Mummy Collection, long housed in a museum of curiosities in Niagara Falls NY, was purchased by Emory University. Some of these mummies and their coffins can be traced to the same time period and place where grave robbers discovered the Deir El Bahari Cache of Royal Mummies near Luxor, Egypt. This history together with the fact that one mummy's arms were placed across his chest has raised speculation that this mummy might be that of Rameses I. Radiological examinations at Emory have included lateral skull x-ray cephalograms of this mummy which have been analyzed utilizing conventional craniofacial variables. These data have been compared to similar measurements derived from the cephalograms of the royal mummy collection at the Cairo Museum. Utilizing multivariate cluster analyses, the mummy “Rameses I” has been compared to the royal mummies from the 17th through the 22nd dynasties. Craniofacial similarities and dissimilarities are discussed.

THE PEOPLES OF GUANAQUEROS: INFECTIONS, ARTHRITIS, AND TRAUMA IN AN ARCHAIC PERIOD “BEACH RESORT”. Maria Araya Rosado, Kathleen Divaccaro, Kristie Lewis, Amber Peterson, and Heather Schiffer

Chile's semiarid north is well known for its excellently preserved osteological collections that cover a period of at least 3,000 years and are elaborately documented through archaeology. Among these collections are those representing the Archaic period excavated in 1995 from Guanaqueros- a littoral site that has yielded exceptional preservation of human and animal remains, and has permitted a detailed documentation of paleopathologies. The paleopathology data collected to date have been integrated into an existing database housed at the Museo de La Serena, Chile. This database is currently being used as baseline information for researchers interested in understanding biological adaptations of the prehistoric peoples of Chile's semiarid north. The objectives of this study and communication are: (a) to describe the patterns of dental and skeletal disease (dental abscesses and caries, trauma to the long bones, osteomyelitis, osteoarthritis, and anemia); (b) to document taphonomy; and (c) to share the conservation protocols applied to date to protect the remains.

**HYPOPLASTIC ENAMEL DEFECTS IN SUBADULT PIGS FROM THE EARLY
MEDIÉVAL FORTRESS STARIGARD/OLDENBURG, GERMANY (10TH CENTURY
AD). Wolf-Rüdiger Teegen**

In this poster, the presence of hypoplastic enamel defects in subadult pigs (below 12 months of age) from the early medieval fortress Starigard/Oldenburg, Germany (10th century AD) are discussed. Approximately 30% of the mandibles with the preserved dp4 showed linear enamel hypoplasia (LEH), indicating stress during intra-uterine development. Due to the fact that most primitive pigs deliver their offspring in spring, it can be concluded, that these stress episodes occurred during winter. A possible cause for LEH could be famine and/or diseases of the pregnant sow.

**PALEOPATHOLOGICAL STUDIES OF COMBINED BURIALS OF HORSES AND
HUMAN NEONATES IN THE IRON AGE SETTLEMENT KARSDORF #9
(GERMANY). Wolf-Rüdiger Teegen and Hans-Jürgen Döhle**

During excavations between 1996-9, burials of two horses were discovered. During excavation, below the horse skeletons human neonates were found. Their skeletons were nearly completely preserved. The analysis of the human bones showed no pathological alterations. One of the horse skeletons, however, showed intravital tooth loss following an extended inflammatory process in the mandible.

**POSSIBLE ADULT DOWN SYNDROME FROM THE BERRY SITE IN FULTON
COUNTY, ILLINOIS. Anna S. Tison**

Congenital disorders are generally underreported in the paleopathological literature due to the often subtle morphological differences exhibited in these disorders. An adult female from the Berry site in Fulton County, Illinois, exhibits a small narrow face, platypellic os coxae, shallow oval shaped femoral heads, and unusually gracile, slender long bones. Her facial craniometrics are compared to other Middle Mississippian females. Differential diagnosis suggests Down and Prader-Willi as candidate syndromes underlying her dysmorphology.

**CHARLES MERBS AND HIS WORK AT THE SAN DIEGO MUSEUM OF MAN.
Rose A. Tyson**

In 1979 the Museum of Man received a grant from the National Science Foundation Program for Support for Anthropological Collections for the conservation, storage, and description of the Hrdlička Paleopathology Collection. The collection contains over 1000 specimens, mainly from Peru. Charles Merbs of Arizona State University was engaged as the consulting paleopathologist for the project. He wrote the description of each specimen and selected examples for two slides series—pathologies and trephinations. Dr. Merbs wrote descriptions for each slide and photographed many of the specimens. The slides

have been useful for teaching and as a resource for comparative studies. In 1987 a second NSF grant was received for the Stanford-Meyer Osteopathology Collection of nearly 3500 specimens. Dr. Merbs resumed his role as consultant and prepared the descriptions of this collection of early 20th century dissecting room material. Dr. Merbs has been supportive of museum endeavors and is responsible for inaugurating the Forensic Science Seminar Series.

HUMERAL CROSS-SECTIONS AND PATHOLOGY: A COMPARISON OF 18TH C. QUEBEC PRISONERS OF WAR WITH 20TH C. NEW MEXICO SUBURBANITES.
Elizabeth Weiss

Null support was found for the hypothesis that high levels of physical activity result in greater humeral robusticity and asymmetry. Aggregate measures of cross-sectional robusticity and asymmetry were used to compare prisoners of war (n = 25) who had high levels of activity, with suburbanites (n = 25) who had low levels of physical activity. For robusticity, z-score means were -0.70 and -0.69 (F = 0.19, P = 0.66); for asymmetry, z-score means were -0.22 and -0.15 (F = 0.04, P = 0.85). However, the prisoners had higher levels of pathology than the suburbanites (e.g., 80% vs. 13% osteoarthritis; F = 33.39, P < 0.01). The lack of cross-sectional differences between the samples may be the result of: (1) pre-existing biological factors; and/or (2) the prisoners' poor diet, which can hinder bone remodeling; and/or (3) the prisoners' pathologies were due to poor bone health rather than high levels of activity.

DID MUMPS EXIST IN THE NEW WORLD IN PRE-COLUMBIAN TIMES? Linda M. Wells, Sonia Guillén, and Marvin J. Allison

A naturally mummified body was identified in Southern Peru as a young male approximately 12-18 months old from the Tiwanaku culture (c. 800-1400 AD). The significant pathology identified was bilateral markedly enlarged parotid glands and reactive bony changes on the surface of the facial bones deep to the glands indicating an intense inflammatory process and adherence of the soft tissue to the bone. The entire trachea and larynx were also identified. The interior of the larynx showed thickened folds of desiccated mucosa overlying the epiglottis and larynx. Also seen was a dried exudate adherent to the mucosa. The most likely immediate cause of death was asphyxia from bacterial epiglottis/laryngitis superimposed on a viral parotitis. An etiological consideration for this case is the mumps virus. This would be a controversial diagnosis as it is thought that mumps did not arrive in the New World until the Europeans came. DNA studies may help solve this mystery.

HEREFORD AND THE BLACK DEATH: THE HEREFORD CATHEDRAL CLOSE CEMETERY (U.K). Darlene Weston and Anthea Boylston

In 1993 the Hereford Cathedral Close cemetery was excavated by the Hereford City Archaeological Unit to make way for a new building housing the treasures of the Cathedral, including the *mappa mundi*. The excavation revealed three burial phases (early Saxon, late Saxon and Medieval). A total of 1129 articulated burials were recovered, including a substantial number of juveniles. Of special interest are 189 burials of individuals interred in three mass graves – a result of the epidemics of the Black Death, which swept through Hereford in AD 1349 and AD 1360-61. The multi-phased nature of the cemetery allows for comparisons to be made between individuals derived from the different time periods, while the single inhumations and mass graves allow for comparisons between attritional and catastrophic burial contexts. Individuals from all contexts have demonstrated a range of pathological conditions including joint disease, dental disease, infections (e.g., tuberculosis), fractures, activity-related pathology, and circulatory diseases.

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