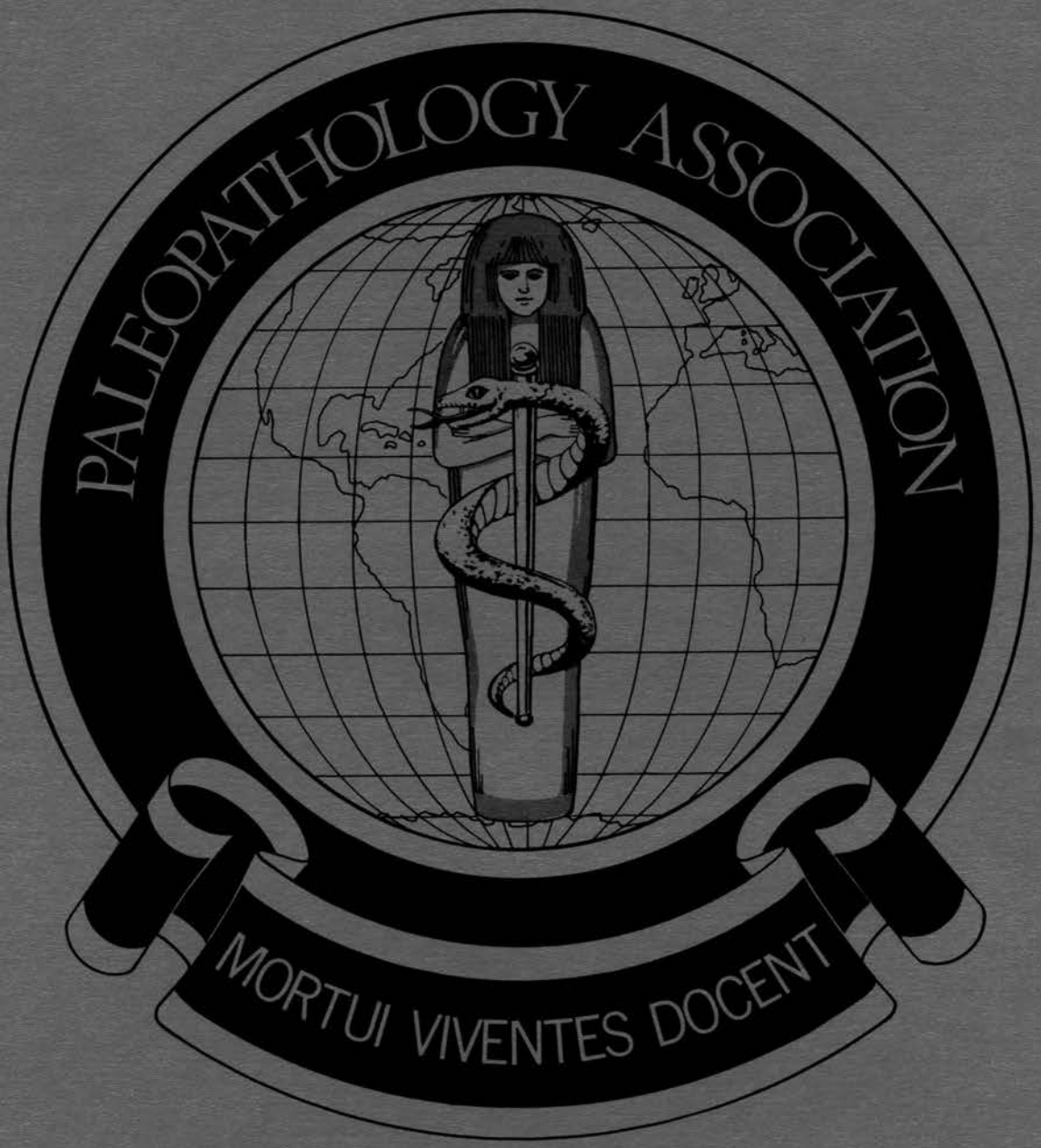
PAPERS ON PALEOPATHOLOGY

presented at the

Twenty Fifth Annual Meeting



31 March and 1 April 1998

Salt Lake City, Utah

SECTION 1: WORKSHOPS

A. WORKSHOP X: HUMAN SKELETAL DISEASE WITH AN EMPHASIS ON DISEASES CAUSED BY MALNUTRITION

Organised by Donald J. Ortner, Smithsonian Institution and Bruce D. Ragsdale, Central Coast Pathology Consultants

Conducted by Donald J. Ortner and Bruce D. Ragsdale, with assistance from Elizabeth Miller

As in previous workshops the conveners provided a combination of hands-on study of pathological cases, a general introduction to the diseases being emphasized in the workshop, and a review of each of the cases studied by the participants. Ortner began the workshop with a review of three diseases that result from malnutrition: iron deficiency anemia, rickets, and scurvy; however, the emphasis was on scurvy. Ortner emphasized that various pathological processes can cause porotic and hyperostotic lesions of the skull. Differential diagnosis depends on careful attention to anatomical detail but even with this, specific diagnosis is not always possible. Part of the problem is that any two or even all three of these diseases may occur in the same individual. Because there are multiple causes of porotic and/or hyperostotic lesions, a diagnosis of anemia requires clear evidence of marrow hyperplasia. Ortner presented data on the prevalence of scurvy in several subadult archaeological skeletal samples which ranged from zero in a sample from the American Plains to 16 percent in skeletal samples from Florida. Scurvy clearly is a significant cause of morbidity and probably mortality in archaeological samples. Because some of the lesions associated with this disease have also been linked to iron deficiency anemia great care needs to be exercised in any study of either of these diseases in an archaeological skeletal sample.

Four modern macerate examples of skeletal disease were included in this year's laboratory, providing the basis for the traditional good-natured competition in diagnostic skill. An angiotropic angiosarcoma arising in the talus of a 70 year old male created multiple small diamond shaped lytic cortical defects in small bones of the feet, as well as tibia and fibula, as endovascular tumor skipped through the extra-osseous venous system from bone to bone. A 55 year old obese diabetic female suffered neuropathic ankle destruction over a 1-1/2 year period, with loss of over 50% of the talus and creation of a debris-filled sub articular oval lucency in distal tibia, incorrectly suspected during life as harboring an abscess. An osteoarthritic femoral head from a 42 year old female had extraordinarily large subarticular osteoarthritic cysts, plus a history of trauma due to a fall on that side more than 20 years before; the contralateral hip was normal, verifyng that this is an example of post-traumatic osteoarthritis. An eburnated radial head illustrated secondary osteoarthritis following rheumatoid arthritis; erosive changes are still apparent around the joint margin, indicating ongoing rheumatoid activity.

B: LEPROSY WORKSHOP (OR: BRINGING LEPROSY TO NORTH AMERICA)

Organised by Charlotte Roberts, University of Bradford

Conducted by Charlotte Roberts, with assistance from Anthea Boylston, Pia Bennike and John Molto

Attended by about 40 people, this workshop aimed to introduce the infectious disease of leprosy to participants not familiar with the condition in the archaeological record, and to refresh the memories of people who were. 'Bringing leprosy to North America' was quite an apt name due to its absence in the skeletal record there and therefore examples of archaeologically derived leprous bone and associated radiographs, plus radiographs of modern leprous individuals from Africa and India, needed to be transported to the venue! These specimens (mainly from the medieval leprosy hospital cemetery from Chichester, Sussex, England curated by the Calvin Wells Laboratory) were supplemented by skeletal material from Denmark brought by Pia Bennike (from the Naestved Medieval Leprosy Hospital) and from Egypt by John Molto (from the Dahkleh Oasis). The modern x-rays derive from a large collection donated by Johs Andersen (Danish leprologist) to the Calvin Wells Laboratory.

The format of the workshop consisted of an introductory lecture session covering the importance of leprosy today and in the past, including its palaeoepidemiology, pathogenesis, clinical features, bone change, methods of diagnosis in the skeleton, and differential diagnosis. A practical, hands-on session looked at bones and x-rays of leprous material, followed by a review of posters and a final lecture on historical aspects of leprosy. The poster by R.L. Parr, S. Walters, J. Capricci, T. L. Dupras and J. E. Molto titled 'A tale of two lepers from the Dakhleh Oasis, Egypt: a preliminary report on chemical and molecular analysis' documented the analysis of skeletons, including two leprous individuals from Egypt, and suggested that the lepers lived outside the oasis but that, based on mitochondral DNA, one of them had maternal relatives there. The poster by M. Lewis, P. Bennike and C. Roberts, 'Infant and childhood leprosy: clinical and palaeopathological implications', considered the effects of leprosy on the development and survival of children born to mothers with lepromatous leprosy, and discussed the evidence for childhood leprosy in the medieval leprosy hospital cemeteries at Naestved, Denmark and Chichester, England. Other supporting posters in the session illustrated previous work on various aspects of individuals from the Chichester cemetery. The workshop highlighted the usefulness of considering all aspects of one disease in antiquity using a biocultural approach.

Thanks to Lorna Pierce, Lynn Kilgore and Eve Cockburn for organising the logistics for the workshop, Anthea Boylston (Bradford) and Sarah King (Cambridge) for helping in the practical hands-on session, Mary Lewis (Bradford), John Molto (Thunder Bay, Ontario) and Pia Bennike (Copenhagen) for presenting papers and/or posters, and Jason Maher (Osteology Technician at Bradford) for doing the archaeological specimen x-rays for the workshop. Finally thanks to Keith Manchester for allowing use of his handout 'Bone changes of leprosy', and for introducing me to such a fascinating disease.

INFANT AND CHILDHOOD LEPROSY: CLINICAL AND PALAEOPATHOLOGIC IMPLICATIONS (poster)

Mary E. Lewis and Charlotte Roberts, Bradford University and Pia Bennike, University of Copenhagen

In recent years, the clinical literature has highlighted the importance of maternal health in the survival and development of the foetus and infant. The growth and survival of the infant is dependent on the timing and severity of maternal infection and/or malnutrition. This study illustrates the effects of leprosy on the development and survival of children born to mothers suffering from lepromatous leprosy and discusses evidence for childhood leprosy in the past, using studies from the Danish leprosy cemetery at Naestved. We conclude that the diagnosis of children with leprosy in the past and present is hindered by the subtle nature of the disease in young individuals and their susceptibility to other diseases, which means they may die before changes can occur.

LEPROSY IN DENMARK

Pia Bennike, University of Copenhagen

Four cases of odontodysplasia (frontal teeth with short roots) were first described by K. Danielson in 1970. This anomaly in relation to leprosy has been reported only in the Danish skeletal material from leprosy cemeteries. A new study of the anomaly, the mechanism, and the various causes is in progress. Dr V. Møller-Christensen, responsible for the excavation of more than 700 skeletons, was noted for his descriptions of the leprous changes in the facial bones and the skeleton as a whole. All skeletal material is stored at the Leprosy Museum, an annex of the Museum of Medical History at the University of Copenhagen, and there is a permanent exhibition of leprous changes in bones and of leprosy in the past.

A TALE OF TWO LEPERS FROM THE DAKHLEH OASIS, EGYPT: A PRELIMINARY REPORT ON CHEMICAL AND MOLECULAR ANALYSIS (poster)

R. L. Parr, S. Walters, J. Capricci, T. L. Dupras and J. E. Molto, Lakehead University

Excavations at Kellis 2, a Roman-Christian cemetery at the Dakhleh oasis, have uncovered remarkable skeletal abnormalities. The high frequency of spina bifida occulta (>20%) and the presence of two lepers, interred with the general population, suggests an absence of cultural prohibitions against leprosy. The initial phase of research combines paleodietary reconstruction (stable isotope analysis of 15N) with genetic analysis (mitochondrial DNA sequencing). Preliminary results suggest that both lepers lived outside the oasis, perhaps in the Nile River valley, for some time before coming to the oasis. Preliminary mitochondrial DNA sequencing indicates that one of the lepers had maternal relatives at the oasis, implying that this individual was a native there.

SECTION 2: CONTRIBUTED PAPERS

PALEOPATHOLOGY OF THE HELLENISTIC PERIOD 'ABDERETES' IN THRACE, GREECE

Anagnosti Agelarakis, Adelphi University

This paper, part of a larger archaeo-anthropological project, presents the paleopathological profile of the Hellenistic (4th Century BC) population of ancient Abdera in coastal Thrace, Greece. Methods of study included the in situ and laboratory inspections, and measuring and archaeometric analyses of the osseous remains, comprising 45 individuals of all age and sex subcategories. The nature, prevalence, and distribution of conditions of stress and manifestations of disease documented in this skeletal collection present unparalleled circumstances when compared with those of other chronological periods that ante- and post-date the Hellenistic Era at the city of Abdera. Such paleopathological contributions offer significant tools for deciphering aspects of the human condition during antiquity. Subsequently, it was feasible to reconstruct unknown facets of the behavioral patterns, organizational capacities, and perceived environments of the population.

FACT OR MYTH? A RE-EVALUATION OF DANISH FINDS WITH EVIDENCE OF TUBERCULOSIS

Pia Bennike, University of Copenhagen

The occurrence and geographical distribution of various diseases in the past are two of the most important issues in palaeopathology and the history of medicine. Descriptions of specimens that exhibit the first known evidence of the spread of specific diseases such as tuberculosis are therefore valuable to these disciplines. A Neolithic skeleton (4-5,000 BP) from Denmark is thought to be one of the few relevant specimens of its time in Europe. This and other specimens from later ages have been re-evaluated with regard to dating and diagnosis. A case from a mediaeval leprosy cemetery seems also to have been misdiagnosed. The presentation will include a discussion of the bone specimens, their datings and possible differential diagnoses. Bones from a 19th century pathological collection exhibiting pleural plaques, costal lesions, changes in joints and finally facial bones disfigured by lupus vulgaris will also be presented.

POSSIBLE METASTATIC CARCINOMA, DATING TO THE TURKISH CONQUEST IN CRETE

Chryssi Bourbou, Chania, Greece

During rescue excavation in the city center of Chania (Crete, Greece) a Turkish cemetery (AD 17th - 19th century) came to light. Absolute chronology is not

possible yet, as the study is not completed. Besides the poor recovery of Burial 4 (only the skull and three cervical vertebrae were found), the skull belonging to a middle adult (26-45 years) male exhibits characteristic lesions at the frontal bone and the nasion. Excluding a diagnosis of trauma, infectious diseases (e.g., leprosy, tuberculosis or treponemal diseases), the case is more suggestive of a metastatic carcinoma. Malignant neoplasms of bone, both primary and secondary, are of great palaeopathological interest, but uncommon findings in archaeological material, especially from Greece. A summary of pathological conditions includes also dental abnormalities, (AMTL enamel hypoplasia, calculus, periodontal disease and carious lesions), dental anomalies (crowded teeth), and osteoarthritis of the spine.

THE HISTORY, ARCHAEOLOGY AND ANTHROPOLOGY OF A MASS GRAVE

Anthea Boylston, Jennifer Coughlan, Malin Holst, Christopher Knüsel, Shannon Novak and Timothy Sutherland, University of Bradford

The Battle of Towton was fought on 29 March AD 1461 near York in England. It was one of the most important battles in the Wars of the Roses, which were fought in order to determine the succession to the Crown. Towton confirmed Edward IV's claim to the British throne, which he held until AD 1483. It also has the reputation of being the bloodiest battle ever fought on British soil. In August 1996, builders disturbed a mass grave dating to the battle, and a small excavation took place the following month. A total of 37 male burials was recovered, 29 of which were completely preserved. The excavation methods employed are discussed, in addition to preliminary results of the laboratory investigation of the battle victims.

TUBERCULOSIS IN PREHISTORIC ARIZONA

Andrea L. Buck, Arizona State University

The partial excavation of an archaeological site in east central Arizona, occupied from AD 1100 to 1300, revealed 100 burials containing human skeletal remains and associated grave goods. Ceramic dating indicates a directional pattern of burials, with cemetery utilization proceeding from south to north over time. This pattern allows division of the cemetery into two major time components and an evaluation of diachronic changes. In the most recent section of the cemetery, two young adults between 15 and 20 years of age exhibit skeletal changes consistent with a diagnosis of tuberculosis. The skeletal pathology of the two Slade Ruin individuals is described and compared with clinical descriptions of skeletal tuberculosis. Skeletal tuberculosis is an expression of secondary tuberculosis, a condition that occurs only if an individual is frail, with a compromised immune system, and therefore may be a better indicator of a population's health status than other infectious disease processes, where a healed lesion indicates survivability.

PALEOPATHOLOGY OF THE PREHISTORIC LOWER MISSISSIPPI RIVER VALLEY

Steven N. Byers, University of New Mexico

Approximately 400 burials from prehistoric Louisiana were studied for population-based and idiosyncratic abnormalities. Four sites dating from ca. 800 BC to AD 1200 provided the sample: Little Woods, Lafayette Mounds, Crooks Mound and Greenhouse. Porotic hyperostosis and 'generalized' bone disease, which approached 100% at some sites, were the main population-based disorders found during study. In addition, both osteoarthritis and osteophytosis were present but exhibited only minimal expression of these conditions. Also, it was found that trauma, possibly indicative of interpersonal strife, increased through time. Finally, a number of idiosyncratic diseases were found, including probable examples of osteomyelitis, myositis ossificans, treponematosis, and osteomalacia. Implications for the lives of the prehistoric peoples are discussed.

TESTING THE RELATIONSHIP BETWEEN POROTIC HYPEROSTOSIS AND CRIBRA ORBITALIA IN PREHISTORIC CHILEAN POPULATIONS

Sloan Hart and Bernardo Arriaza, University of Nevada-Las Vegas and Vivien Standen, Universidad de Tarapacá-Arica, Chile

Four hundred and forty four pre-Hispanic skulls from northern Chile were studied to understand the degree of correlation between porotic hyperostosis and cribra orbitalia. Thirty two percent (134/418) of the sample had evidence of only cribra orbitalia, whereas 65 percent (284/439) presented only porotic hyperostosis. Forty six percent (95/205) of the sample had simultaneous lesions in the orbits and cranial vault. We were expecting to find similar percentages of cribra orbitalia and porotic hyperostosis, under the assumption that the two conditions are part of the same etiology; thus one would predict the other. This research shows that only one out of every two individuals will have both porotic hyperostosis and cribra orbitalia at the same time. Although we believe there is a relationship between the two markers, one does not appear to be a reliable predictor of the other.

TREATMENT OF FEMORAL SHAFT FRACTURES IN RURAL AND URBAN GREEK COLONIAL METAPONTO, ITALY, 7TH-2ND CENTURY BCE

M. Henneberg and R. J. Henneberg, University of Adelaide, Australia

At a rural cemetery outside the walls of the city of Metaponto, an approximately 55 year old male was buried; his left femur had been fractured several years before death. Broken fragments were joined by extensive callus in the position they had assumed naturally following the injury. The total length of the broken femur was about 80 mm less than that of the corresponding right femur. At the 'Crucinia' cemetery adjacent to the ancient city walls, an approximately 35 year old male was buried; his right femoral shaft has been fractured in the middle. Broken fragments were nearly perfectly aligned and healed with minimal callus formation. The fractured femur was 15 mm longer than the left femur, and it seems that the fracture was set in traction. In neither case was there any sign of infection. It follows that both individuals received good general care, but specialised treatment was available only to the urban one.

TRAUMA IN ANCIENT NUBIA DURING THE KERMA PERIOD

Margaret Judd, University of Alberta

The Upper Nubian people of the Kerma Period (2500-1500 BC) of Sudan are relatively unknown to physical anthropologists, whereas we are well acquainted with the Lower Nubians from the vicinity of the Nile's second cataract. Sixty-one Kerma Period individuals were excavated from two rural cemeteries 100 km south of Kerma (the name-site), which is located near the third cataract. This report, the first in a series that examines habitual activity markers of this sample, describes the occurrence and patterns of adult trauma.

EVIDENCE OF PHYSIOLOGICAL STRESS IN A CHILD BURIED AT PAJONAL ALTO, A LATE PREHISTORIC SITE ON THE SOUTH COAST OF PERU

C. M. Kellner and C. A. Conlee, University of California, Santa Barbara

The skeletal remains of a seated child burial were excavated at the stratified site of Pajonal Alto, Nasca, Department of Ica, Peru. The child, approximately 3-5 years old based on dental development and long bone measurements, suffered from periostitis on the distal third of the diaphysis on both ulnae, both tibiae and the right fibula. Cribra orbitalia is evident bilaterally, of which a portion was still active at the time of death. Severe dental abscesses and carious lesions in the primary dentition also indicate a stressful life for this individual. This child's remains may testify to a period of challenging social conditions during the imperial Wari occupation of the Nasca region. Ongoing study of this site will help clear up issues of the effect of Wari imperial occupation (~AD 750-1000) on local Nasca populations. (Support for this research was provided to Conlee by a National Science Foundation Dissertation Improvement Grant 92-114.)

A POSSIBLE CASE OF PITUITARY DWARFISM FROM NUBIA

Lynn Kilgore, Colorado State University, Robert Jurmain, San Jose State University, Charlotte Roberts, University of Bradford and Dennis P. Van Gerven, University of Colorado, Boulder

The focus of this study is a mostly complete skeleton that exhibits a number of growth abnormalities. Taken together, these are suggestive of pituitary insufficiency. The skeleton was excavated at the Nubian site of Kulubnarti, which is dated to between AD 550 and ca 1600. The skeleton is that of a probable male with an estimated stature of 144 cm. All skeletal elements are abnormally short for this population (measurements for the humerus and femur were over 6 and 5 standard deviations from the mean respectively), and skeletal proportions are normal. The cranium and postcranial skeleton are extremely gracile and areas of muscle attachment are poorly developed. Additionally, the cranium is quite dolichocephalic, with a cranial index of 70, owing to premature fusion of the sagittal suture. Although craniostenosis is not typical of pituitary dwarfism, we suggest

that this individual exhibits various manifestations of hypopituitarism.

THALASSAEMIA IN BAHRAIN?

J. Littleton, Australian National University

Porotic hyperostosis (PH) has been attributed to either iron deficiency or the congenital anaemias. In a population from Bahrain, Arabian Gulf (300 BC - AD 250), a high frequency of PH was observed. Forty percent of all individuals had cribra orbitalia (n=492) and 25 percent had parietal lesions (n=249). Of children under six years, 37 percent had extensive 'hair on end' expansion of the diploe, facial porosity and marrow hyperplasia of the maxillary sinuses. Eight percent had postcranial changes associated with PH: excessive thinning of cortical bone, leading in severe cases to a lattice-like appearance of the postcranial skeleton. The severity and age distribution of these lesions suggest the presence of thalassaemia, but that cannot be responsible for all cases observed, and can be considered only in conjunction with iron deficiency anaemia. Coexistence of more than one anaemic syndrome may be widespread in populations with congenital anaemia.

ANASAZI MUMMIFICATION: A PHOTOGRAPHIC APPROACH

Guido P. Lombardi, Tulane University

Most Anasazi (Hisatsinom) mummies were produced by the dry environment of the Four Corners region where this culture flourished. Nevertheless, some data indicate that the Anasazi practiced artificial mummification as well. The Pepper Collection at Tulane University holds a photographic record about early archaeological explorations at the Grand Gulch (SE Utah), including the recovery of mummies. One of these bodies presents a large sutured abdominal incision, mentioned originally as an 'example of crude surgery.' Because the Anasazi performed other elaborate body preservation techniques (e.g., scalp-and-face 'trophy'), this case might be reinterpreted as an example of artificial mummification.

ENAMEL DEFECTS AND SUBSISTENCE TRANSITIONS IN ANCIENT INDIA

John R. Lukacs, University of Oregon

The origin, character, and decline of the Jorwe culture of western India is surrounded by controversy. Archaeological and paleoclimatic evidence has been interpreted to reveal climatic deterioration and a subsistence shift to nomadism at the site of Inamgaon. New data on developmental defects of enamel in primary teeth from this site are used to evaluate levels of physiological stress in infants and children during this dramatic transition. The most frequent enamel defect observed in the sample of primary teeth from Inamgaon (n=762) is localized hypoplasia of primary canines (LHPC). This enamel defect is present in 39.4% of individuals, and 27.7% of primary canine teeth. Defect prevalence is significantly lower in the

nomadic Late Jorwe sample, and higher among the more sedentary agricultural people of the early Jorwe phase. These results suggest that culturally 'poorer' nomads had better health and growth status than agriculturalists, and that climate, culture, and human biology interact in complex ways; 'cultural degeneration' and 'climatic deterioration' may facilitate improvements in human health status.

AGE-DEPENDENT LOSS OF BONE MINERAL IN THE FEMUR IN A MEDIAEVAL POPULATION

S. Mays, English Heritage, B. Lees and J. Stevenson, Imperial College of Sciences, Technology and Medicine, London

Osteoporosis is today an important and growing health problem, particularly in populations of north European origin. Age, hormonal changes, and a variety of extrinsic factors, many associated with modern Western lifestyles, are widely held to play a part in bone loss. It is therefore of interest to investigate the presence of the disease in earlier human groups with lifestyles very different from our own, with one such study using the skeletal collection from the deserted mediaeval village of Wharram Percy, England. In this population, loss of bone mineral with age is being investigated at a variety of sites in the skeleton using a number of different techniques, with the aim of building up a coherent picture of bone loss in this mediaeval group. This paper reports some recent results. specifically those from the study of bone loss in the proximal femur using dual x-ray absorbtiometry (DXA).

BEJEL IN THE LAS PALMAS POPULATION OF BAJA CALIFORNIA SUR, MEXICO

J. E. Molto, Lakehead University, Canada

One aspect of the treponemal disease problem in anthropological-medical research agreed on by all, is that treponematosis was endemic to New World populations long before Columbus. Questions as to which treponemal diseases were present and their origins and impact on native life in the New World are subject to dispute. This paper reviews recent models, which are assessed relative to treponemal disease, specifically in the remote Las Palmas marine foraging population of the Cape Region, Baja California. Both the Unitarian model (Butler-Hudson) and Infracranial-Lesion Model of Rothschild-Rothschild support the presence of bejel. Of historic epidemiological interest is that this disease was replaced in the historic period as a direct concomitant of missionization, and a relatively benign disease was transformed into a malignant process that then played a significant role in the extinction of the aboriginal peoples of that region in the historic period.

NUTRITIONAL BONE DISEASE

Bruce D. Ragsdale, Central Coast Pathology Consultants

Nutritional skeletal disease accrues from something you either did or did not eat, which results in matrix that is too little, poor in quality, too much, or combinations of these abnormalities. Prototypic conditions of dietary deficiencies are scurvy

(deficiency of vitamin C resulting in deficient synthesis of collagen precursors), rickets (juvenile deficiency of vitamin D resulting in delayed epiphyseal cartilage maturation and synthesis of excessive unmineralizable osteoid), and osteomalacia (adult deficiency of active vitamin D metabolites or presence of inhibitors of mineralization, resulting in accumulation of unmineralized osteoid, especially at sites of accelerated bone turnover). Hypervitaminosis A (resulting in retardation of central regions of major growth plates), plumbism (lead is an osteoclast toxin resulting in bands of increased transverse metaphyseal density due to deficient remodeling, not lead deposition), and fluorosis (ionic-substitution into the crystal lattice for calcium results in mechanically inferior bone substance and excessive periosteal additions with the potential for major nerve compression especially along the spine) are examples of ingestion diseases. Even gout could be included as a nutritional disease (red wine and red meat contributing to the overproduction of uric acid in individuals with genetic deficiencies in purine synthesis).

SURVEY OF PREHISTORIC PARASITES FROM SOUTH AMERICA

Karl Reinhard, University of Nebraska-Lincoln, Adauto Araújo and Luiz Fernando Ferreira, Escola Nacional de Saúde Publica, Fundação Oswaldo Cruz, Brazil

We surveyed parasites from the Atacama Desert of Peru and Chile and also from sites in northwestern Brazil. The analysis of some 400 specimens, combined with published papers, facilitates a comparison of helminths in those areas. *Enterobius vermicularis* (pinworm) has infected humans in Peru and Chile for several thousand years, reaching a high prevalence at some sites. This parasite is absent in Brazil. *Diphyllobothrium pacificum* (fish tapeworm) infected coastal cultures in Peru and Chile throughout prehistory, being nearly ubiquitous in preagricultural times except in the region south of Arica, Chile; its distribution in post-agricultural times has been spotty. Ancylostomids (hookworms) have been found only once in the Atacama Desert, but are common in northeastern Brazil. Other parasites such as *Trichuris trichiura* (whipworm) and *Ascaris lumbricoides* are distributed on both sides of the Andes. The study allows for some hypotheses about the environmental and behavioral factors that regulated the distribution of these parasites in prehistory.

POROTIC HYPEROSTOSIS: A PHENOMENON IN SEARCH OF SIGNIFICANCE

Bruce M. Rothschild, Arthritis Center of Northeast Ohio

Although porotic hyperostosis is a frequently recognized archeologic phenomenon, often attributed to iron deficiency, the diagnosis of primary iron deficiency is contrary to the medical evidence. The pathophysiology of porotic hyperostosis has been explained as a marrow hyperplasia, which radiologically (in the skull) is recognized as a 'hair on end' or 'crew cut' phenomenon. Far from evolutionary evidence for the role of iron deficiency, it is critical to examine the basic tenet that one can actually recognize iron deficiency on the basis of skeletal examination. It seems problematic to consider iron deficiency as a cause of hyperplastic marrow. If there is inadequate iron for blood cell production, the marrow may actually be hypo-regenerative. The only identified study of the frequency of skull changes in

iron deficiency revealed a frequency of only 0.68%! Clinical records denote no relationship between the degree of anemia or iron deficiency and the occurrence of the 'hair on end' phenomenon of porotic hyperostosis. Ascribing high population frequency occurrence of porotic hyperostosis to iron deficiency anemia no longer seems tenable.

PERSPECTIVES ON THE DIAGNOSIS, PALEOEPIDEMIOLOGY AND EVOLUTION OF TREPONEMAL DISEASE IN THE NEW WORLD

Mary K. Sandford, University of North Carolina at Greensboro, David S. Weaver, Wake Forest University, Georgieann Bogdan and G.E. Kissling, University of North Carolina at Greensboro

We use skeletal samples from the Tutu site (St. Thomas, USVI, AD 450-1450), the North Carolina coast (seven sites, AD 800-1500), and the Barrett site (Kentucky, 3000-1500 BC) to support our conclusions concerning the diagnosis, paleoepidemiology and evolutionary aspects of the New World treponematoses. Lesions seen in the three samples share some characteristics of treponemal disease, while demonstrating some variation in their specific manifestations and skeletal distributions. We relate our findings to current discussions on diagnostic categories, descriptive terminology, probable modes of transmission, disease interactions, host-pathogen characteristics, disease manifestations, and the probable consequences of treponematoses.

PALEOPATHOLOGY IN THE LATE ASSYRIAN QUEENS' BURIALS AT NIMRUD (IRAQ)

Michael Schultz, University of Göttingen and Manfred Kunter, University of Giessen, Germany

In 1988 and 1989, three vaulted tombs and one isolated burial from Late Assyrian times (8th century BC) were excavated at Nimrud, one of the most famous residences of Late Assyrian kings. Altogether, 17 individuals could be identified. All interred persons belonged to the upper social class, and were buried with spectacular grave goods. At least three of these burials represent the interment of Assyrian queens. The skeletal remains were examined by macroscopic, radiological, endoscopic, light and scanning electron microscopic techniques. It is striking and difficult to understand that these upper class people were relatively ill. We found not only unspecific stress markers (e.g., Harris's lines, transverse linear enamel hypoplasia), but in several cases also evidence of meningeal diseases, middle ear disease, periodontal disease, and osteoarthritis. Vestiges due to inflammatory processes of the skull vault could also be diagnosed.

LUMBOSACRAL VARIATION AND MALFORMATION IN THE ANCIENT INHABITANTS OF SAN NICOLAS ISLAND, CALIFORNIA

Susan Kerr Siefkin, Kevin W. P. Miller, and Phillip L. Walker, University of California, Santa Barbara

Human habitation of San Nicolas Island, located 60 miles off the coast of Southern California, lasted for over 5,000 years but only one woman remained on the island at the time of European contact. Today, skeletal remains are the only way we may know about the life of the ancient Nicolenos. Archaeological evidence suggests that the people of San Nicolas were culturally, and perhaps genetically, isolated from other island and mainland groups. Examination of a skeletal collection from San Nicolas Island revealed a high incidence of morphological variation and malformation of the lumbosacral region in these people. Previous studies of the lumbosacral region have implicated both genetic and environmental conditions as the cause of such features. Our research suggests that the frequency of lumbosacral anomalies including spina bifida, spondylolysis, and spondylolisthesis in the inhabitants of San Nicolas Island may be a response to effects of isolation, migration, repetitive activity patterns, and poor resource availability.

CRIBRA ORBITALIA AND POROTIC HYPEROSTOSIS IN AN ALASKAN ESKIMO POPULATION.

Susan L. Steen and Robert W. Lane, University of Alberta

The main objective of this study is to present plausible causal factors responsible for the high frequency of cribra orbitalia and porotic hyperostosis found in an Alaskan Eskimo population from Nunivak Island (n=137). Skeletal lesions of cribra orbitalia and porotic hyperostosis are the result of an iron deficiency as a consequence of inherited anemias, iron-deficient diets or malabsorption of dietary iron. Typically, iron-deficient diets (e.g., protein and iron deficient maize based diets) and genetic factors (i.e., thalassaemia, sickle cell anemia and hereditary spherocytosis) are cited as the primary causes of anemia among prehistoric and historic populations. Although Eskimo groups have traditionally consumed diets rich in iron, skeletal lesions indicate that anemia was extremely widespread in this community. Parasitic infection and diarrheal diseases, as described in ethnographic accounts, appear to be the likely candidates in explaining the prevalence of anemia among the people of Nunivak Island.

TAPHONOMY OF A SKULL CACHE FROM THE NORTH COAST OF PERU

Rose A. Tyson and Alana Cordy-Collins, San Diego Museum of Man

The site of Dos Cabezas is located in the delta of the Jequetepeque River on the north coast of Peru. A small Moche architectural complex of the first century AD was excavated in 1994 by Christopher Donnan and Alana Cordy-Collins. Skulls of eighteen individuals were found lying in an isolated cluster in the southwest corner of a room designated the 'Cuarto de los Craneos.' Mandibles and cervical vertebrae were articulated in eight of the individuals. Cervical vertebrae of four individuals exhibited cut marks.

SECTION 3: POSTER PRESENTATIONS

CEMETERY EXCAVATIONS AT RAUZET, FRANCE

A. Alvrus, Arizona State University and C. A. Hutchison, Western Michigan University

For two seasons (1995 and 1997) excavations have been conducted at a late 16th century village cemetery in Rauzet, southwestern France, located directly adjacent to a 12th century Grandmontine monastery. It is not known how long the cemetery was in use. The area of the cemetery thus far excavated lies next to the church door. Of the 12 burials excavated to date, only two are adults, both females. Abnormalities noted include extensive tooth loss, especially in the molar region, and osteophytic lipping in the thoracic vertebrae. The high frequency of subadults suggests either a high rate of subadult mortality or a specific area of the cemetery that was set aside for subadult burials. The importance of this site lies in its potential to shed light on the health, demography, and burial practices of a post-medieval French village. Future research will focus on subadult mortality, an issue that also has applicability to prehistoric populations. (Funding for Alvrus provided by a National Science Foundation Graduate Research Fellowship and by the Graduate College of Arizona State University.)

VIDEO ENHANCED FIBEROPTIC EXAMINATION OF SKELETAL MATERIAL AND ARTIFACTS WITH RADIOGRAPHIC CORRELATION

Ronald Beckett and Gerald Conlogue, Quinnipiac College

Often anthropologists are limited to external examination of specimens and artifacts; this project employed video enhanced fiberoptic technology to visualize and video document internal features. Among the specimens examined were skulls, including those of a cranially deformed 9th century Flathead Indian, the Mütter Giant, a normal adult, and a 12 year old with Downs Syndrome. The scope was passed through either the supra orbital fissure or foreman magnum to visualize, measure and video document the sella turcica within each skull. A modern ceramic elephant was examined to explore pottery artifact applications. Radiographs were taken of all specimens to correlate with the video findings.

A CASE STUDY IN MULTIPLE SUPERNUMERARY TEETH: TUI-3

K. J. Carlson and E. Pennefather-O'Brien, Indiana University

Treatment of supernumerary teeth in the anthropological literature is primarily limited to the acknowledgment of their existence and/or classification. A review of the odontological literature shows additional concerns with etiology, specifically connections with syndromes. TUI-3 is an unprovenanced adult cranium and mandible with multiple supernumerary teeth (MSNT) in the anterior maxilla. We investigate the etiology of MSNT in this individual with respect to possible syndromes, non-syndromes and field versus clone theory of tooth formation. Many syndromes with high occurrences of supernumerary teeth can be eliminated because TUI-3 does not exhibit other facial characteristics that are diagnostic. We are unable to differentiate between remaining syndromes that have no other cranial manifestations and non-syndrome related MSNT. Occurrence of the latter is, however, rare.

THE USE OF POLAROID PHOTOGRAPHIC IMAGING SYSTEM TO PRODUCE RADIOGRAPHIC IMAGES AT A FIELD ARCHAELOGICAL SITE IN PERU

Gerald Conlogue, Quinnipiac College and Andrew Nelson, University of Western Ontario

The project represents the first large scale evaluation of a Polaroid photographic imaging system as an aid to field radiography. The 4" x 5" photographic film system proved to have a number of advantages over conventional radiographic film in the remote littoral desert of the north coast of Peru. The Polaroid film provided an image in 90 seconds with resolution comparable to x-ray film without the need of liquid chemicals and a darkroom. This permitted the ad hoc examination of specimens as a screening procedure to determine which specimens required further examination. The photographic product was also easier to transport and less sensitive to heat fogging than x-ray film.

CONGENITAL SYPHILIS IN THE PAST: A PROTOHISTORIC CASE FROM MISSISSIPPI

Della Collins Cook, Indiana University, Marie Elaine Danforth, University of Southern Mississippi and Keith P Jacobi, Alabama State Museums, Tuscaloosa

The first case of dental lesions suggestive of congenital syphilis in a protohistoric native American is reported. A juvenile mandible with Moon's molars and Hutchinson's incisors was recovered near Natchez, Mississippi, and has been dated to AD 1434 ± 1- 55 years. Other claims of dental lesions attributable to congenital syphilis in precontact American Indian remains are reviewed, but none offer compelling evidence. Reasons for the rarity of these lesions may include rapid wear and associated loss of teeth with severe hypoplasia as well as the lesser expression of lesions in groups with the relatively thick enamel characteristic of the Mongoloid dental complex. The absence of Moon's molars and Hutchinson's incisors in other prehistoric New World populations, however, suggests that other neonatal causes of disruption of enamel formation in addition to congenital syphilis must be considered.

PALEOPATHOLOGY OF THREE MIDDLE TO LATE WOODLAND CEMETERIES FROM GREENE COUNTY, INDIANA

Lorena M. Havill and Kimmarie A. Murphy, Indiana University

Analyses of prehistoric skeletal material from Indiana are scarce. In an effort to remedy this situation, 140 individuals from three proximate cemeteries from Greene County, Indiana are examined. Based on archaeological associations the three sites (Bucci, Shaffer, and Shepherd) represent the transition between Middle and Late Woodland occupations. These populations are characterized by extensive tooth wear with associated caries and abscesses, age related arthritic changes, and senile osteoporosis. Evidence for traumatic events is limited to healed fractures and periosteal reactions on limb bones and an ossified hematoma of the cranial vault. Cribra orbitalia is prevalent among juveniles. In addition, several individuals display equivocal evidence for rickets. The observed health patterns within and among these populations contribute to a more comprehensive understanding of life in prehistoric Indiana.

PALEOPATHOLOGY OF A PREHISTORIC CADDOAN BURIAL MOUND COMPLEX FROM NORTHEASTERN TEXAS

Christine Lee, Arizona State University

The Hatchel, Mitchell, and Moores sites are probably the remains of one large Caddo ceremonial center and associated village (ca AD 1300-1700). Eighty-five individuals from the village cemeteries and two burial mounds were included in this study. This poster will present some changes noted during the course of study of known and unknown etiology. The Caddo practiced cranial modeling and two cases are presented where secondary lesions appeared, one on the frontal of an adult, and one on the occipital of an infant. Trauma was rare and healing occurred with little complication as evidenced by a well healed humerus and a clavicle with pseudarthrosis. The Caddo show three cases of developmental defects: brachydactyly, spina bifida occulta, and osteochondritis disseccans. Three cases of unknown etiology are also presented: a possible case of torticollis from birth trauma, a possible lung adhesion to a rib, and a possible trauma to the spine.

THE FIRST FIREARMS FATALITY IN DENMARK

Niels Lynnerup, Klaus Poulsen, Bruno Frohlich and Henrik Hjalgrim, (NL, KP, HH, University of Copenhagen; BF, Smithsonian Institution)

One of Denmark's 17 known Benedictine nunneries was excavated in 1989 in Randers, Denmark. The church, built about AD 1100, also served as parish church. Two graveyards were located, one south of the church, which was presumably used by the nuns, and a second east of the church used by the parish. The parish cemetery yielded a minimum of 530 skeletons, originating from 252 well defined single graves, several mass graves and some stray finds. One of the stray finds included a male skull with a badly damaged facial skeleton and sphenoid bone.

An iron ball, approximately 26 mm in diameter, was found within the calvarium. Subsequent analyses revealed it to be a small cannon ball made of wrought iron. Radiocarbon analysis of cranial fragments resulted in a date of AD 1290 (AD 1200 - 1400). The first Danish accounts on firearms date to AD 1360. It is likely that our case predates this in addition to being the first known firearms fatality in Denmark.

TUBERCULOSIS IN A RURAL MEDIAEVAL POPULATION

S. Mays, English Heritage

A number of cases of possible tuberculosis have been identified in the collection of skeletal remains from the deserted Mediaeval village of Wharram Percy, England. These cases are described and discussed in the light of likely risk factors for tuberculosis in this population.

MAXILLARY SINUSITIS: RESPIRATORY HEALTH IN A FIFTEENTH CENTURY IROQUOIAN POPULATION

Deborah C. Merrett, University of Guelph

Sinusitis is one of the most commonly reported infectious diseases, affecting an estimated 14% of Americans. The prevalence of maxillary sinusitis should, in part, reflect the respiratory health of the population, as well as the air quality and airborne pathogen level in the environment. Three hundred and forty seven maxillae of a Southern Ontario Iroquoian population, Uxbridge Ossuary, ca AD 1440, represent a minimum of 123 adults, 22 adolescents, 66 juveniles and 5 infants. In 46% of the individuals examined, changes to bone morphology were observed. Among adults, alveolar abscessing becomes a confounding variable in the etiology of sinusitis. Osseous changes independent of dental deterioration (abscessing) occur in a substantial proportion of infants, juveniles and adolescents. It is suggested that tuberculosis, which is known to have been present in the Uxbridge population, may have contributed to the maxillary sinus lesions of the younger individuals in the sample. In addition, the osseous changes of the maxillary sinuses may be used to infer the presence of chronic respiratory infection in past populations.

LUMBAR PATHOLOGY AND THE INTERPRETATION OF ARIKARA LIFESTYLE

Elizabeth Miller, California State University, Los Angeles and Juliet Cleaves Brundige, Smithsonian Institution

Spondylolysis and other vertebral abnormalities have been used by previous authors to reconstruct changes in lifestyle before and after European Contact. This study examines lumbar pathology in 547 individuals recovered from 24 Arikara sites in South Dakota, dating from the early 1600s through the mid-1800s. Of the 547 individuals examined, 272 had one or more lumbar vertebrae available and in good

condition. The vertebrae were examined for the occurrence and severity of spondylolysis, spondylolisthesis, osteophytosis, trauma, and anomalies. Preliminary statistical analysis appears to indicate that, among the Arikara, spondylolysis and other lumbar changes were evenly distributed between males and females, and that this distribution did not change during the period under consideration. Additionally, there does not appear to be a change in the age of onset for these lumbar conditions during the same time period. The data, and the conclusions regarding changes in lifestyle among the Arikara prior to and after European intrusion into their geographic area are discussed.

LIFE HISTORY RECONSTRUCTION THROUGH COMBINED PB-, SR- AND 0- ISOTOPE ANALYSIS OF DENTAL TISSUES

Janet Montgomery, Paul Budd, Barbara Barreiro, Carolyn Chenery, Charlotte A. Roberts and Richard G. Thomas, University of Bradford (JM, PB, CAR), Isotope Geosciences Laboratory (BB, CC) and University of Sydney, Australia (RGT)

This poster outlines an application of combined Pb-, Sr- and O-isotope analysis of dental tissues in order to investigate past residency patterns. Blackfriars 77, a young adult female, presents a rare and interesting case of tertiary phase syphilis from a Dominican Friary burial ground in Gloucester, England. Osteological evidence supports an African ethnic origin. Archaeologically dated to the 15th century, it is also important in the Old World/New World debate on the origin of the treponemal diseases. Analysis of dental tissues was carried out in order to ascertain whether there was any isotopic evidence to show that Blackfriars 77 had resided in Britain during childhood or migrated later in life, bearing the disease into a treponemal-free area. Results show that there is no evidence to suggest that Blackfriars 77 did not spend her childhood in Britain, all her isotopic signatures falling within the variation exhibited at the site. The case study highlights the potential for combined isotopic measurement of dental tissues as a powerful tool in resolving issues of place of origin.

UNKNOWN HIGH RADIOLOGICAL DENSITY SUBSTANCE IN AN ANCIENT EGYPTIAN MUMMY: AN UPDATE OF PHYSICAL AND CHEMICAL ANALYSIS AND INTERPRETATION

Frank Rühli, University of Zurich Medical School, Thomas Böni, Orthopaedic University Clinic Balgrist, Georges Bonani, Institute of Particle Physics, Peter Iten, Institute of Legal Medicine, Max Spycher, University-Hospital Pathology Department and Beat Rüttimann, Institute for the History of Medicine (all Zurich)

As a result of paleopathological examinations, an unknown high radiological density intraarticular substance was found in an ancient Egyptian mummy (J Paleopath. 1995, 7(2):131). A total of 7 samples of the right knee region was examined to determine the components and age of this artificially applied material, using infrared spectras, scanning electron microscopy, gas chromatography, mass spectometry and radiocarbon dating by accelerator mass spectrometry. Ca, C and 0 were found as the main elements. Two samples seemed to be of an organic

material and embalming liquid containing terpenes, steroids, fatty acids and unknown substances. Radiocarbon dating of all samples continues. Most were located next to a postmortem fracture of the lower femur and in other joints as well. Radiological examination supports the interpretation of their use as a postmortem repair substance. A discussion of historical content and a literature review will finish the presentation.

SCIENTIFIC VISUALIZATION AND PALEOPATHOLOGY: AN OVERVIEW

Mary K. Sandford, T. M. Craven, J. P. Mahoney and G. E. Kissling, University of North Carolina at Greensboro

The field of scientific visualization is burgeoning in the life, physical and biomedical sciences. In this poster, we shall demonstrate how techniques involving scientific visualization can be used to document, archive and analyze human skeletal materials. Although the historical roots of scientific visualization date back centuries, current applications of this technology usually involve the analysis and interpretation of images to delineate patterns, associations and 'anomalies' in computer digitized data. We shall use osteological samples and field notes to illustrate basic techniques for digital capture, storage and image enhancement in both field and laboratory settings. In particular, we shall show how methods employing high resolution scanning and digital photography can enhance the quantitative and qualitative analyses of gross skeletal pathology through better evaluation of macroscopic pathology and ease of osteometric measurement.

PRELIMINARY ANALYSES OF SKELETAL PATHOLOGY FROM THE BARRETT SITE: POSTCRANIAL LESIONS

Mary K. Sandford, D. Guida, Georgieann Bogdan, University of North Carolina at Greensboro, David S. Weaver, Wake Forest University and G. E. Kissling, University of North Carolina at Greensboro

In this poster, we discuss postcranial lesions documented on many of the Late Archaic adult skeletons from the Barrett site, McLean County, Kentucky. The characteristics and distributions of many of the lesions suggest a treponemal syndrome. Bilateral involvement is typical, as are the skeletal signs of linear striations of periosteal plaque, diffuse pitting, and conical irregularity. The patterning of some lesions is not typical of previously described treponemal syndromes: lesions sometimes commence at the metaphyses, whereas others occur in close proximity to muscle attachments. We suggest specific mechanisms, including remodeling rates, mechanical forces, inflammatory factors, and transmission modes that may account for the formation, characteristics, and distribution of the lesions.

PRELIMINARY ANALYSES OF SKELETAL PATHOLOGY FROM THE BARRETT SITE: CRANIAL LESIONS

Mary K. Sandford, C. Marcello, University of North Carolina at Greensboro, David S. Weaver, Wake Forest University, Georgieann Bogdan and G. E. Kissling, University of North Carolina at Greensboro

In this poster we focus on cranial lesions documented among the 412 human skeletons from the Barrett site in Kentucky (Late Archaic period, ca 5,000 - 3,000 BP). A majority of the adult skulls examined thus far display cranial lesions, some showing characteristic signs of treponematosis, with others exhibiting remodeled punctuate and/or remodeled vermiculate conical surfaces. The lesions are often associated with muscle attachments and variably with diploic changes. We describe these lesions, document their spatial distribution along the cranium, and review their associations with postcranial inflammatory lesions. We identify processes (including remodeling rates and mechanical forces) that are responsible for the lesions, and compare them to similar skeletal signs associated with diseases such as treponematosis.

HYPOPLASTIC FOURTH METATARSALS AND EPIPHYSEAL DYSPLASIA IN AN INDIVIDUAL FROM PREHISTORIC ILLINOIS

A. K. Wilbur, University of New Mexico

The large, well-preserved skeletal samples from prehistoric Illinois have yielded extensive information on ancient diseases. Measurements of crania and long bones of the Illinois series enable metric comparison of specific individuals with the rest of the population. This poster describes an individual (F14-68) of the Mississippian period from Fulton County that exhibits several skeletal anomalies suggestive of a congenital defects syndrome. F14-68 is the essentially complete skeleton of an adult male with bilateral hypoplastic fourth metatarsals and vertebral and knee anomalies that indicate epiphyseal dysplasia. Cranial and facial proportions are average, although apparent premature closure of the left occipito-mastoid suture causes some asymmetry of the vault. The skeletal anomalies are consistent with those seen to occur with Refsum Disease (also known as Phytanic Acid Oxidase Deficiency or Heredopathia Atactica Polyneuritiformis), a condition characterized by the inability to metabolize phytanic acid.

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