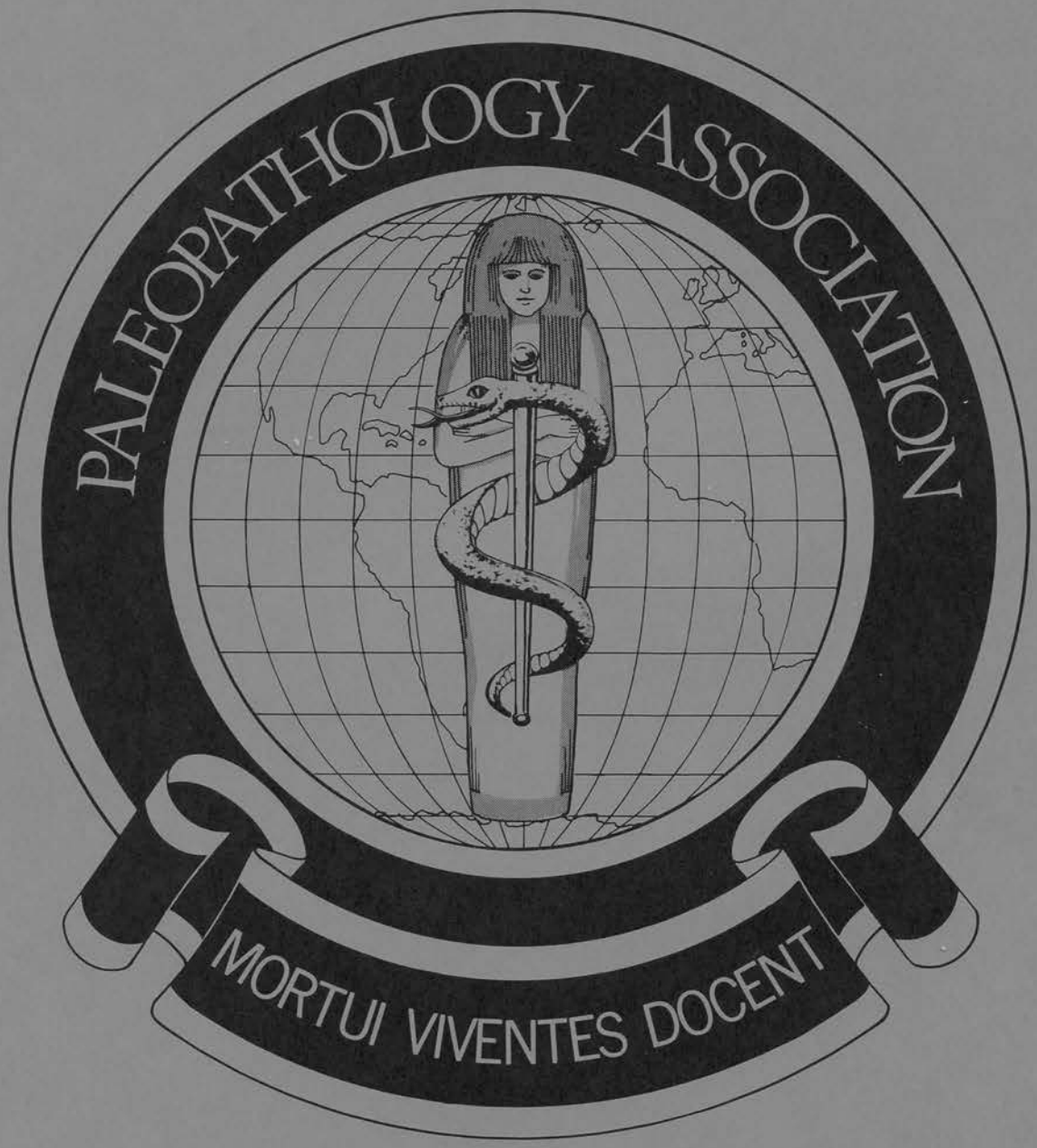
PAPERS ON PALEOPATHOLOGY

presented at the

Eighteenth Annual Meeting



2 and 3 April 1991

Milwaukee, Wisconsin

SECTION 1: CONTRIBUTED PAPERS AND POSTERS

Coordinators and Moderators: Robert Jurmain and Lynn Kilgore,
San Jose State University

ASPECTS OF SKELETAL BIOLOGY FROM THE BYZANTINE SITES OF ABDERA, GREECE

Anagnosti Agelarakis, Adelphi University

This paper presents the results of palaeopathological and palaeoepidemiological investigations concerning two human skeletal series from Abdera (Greece), dating to the Middle (950-1100 AD) and Late Byzantine (1150-1250 AD) time periods. Although no evidence of biodistance has been determined between the two series, there were significant differences observed in the skeletal record, with particular emphasis on the manifestations of pathological stress and acquired and degenerative traumatism, as well as epidemiology. The palaeopathological manifestations observed affected age and gender subgroups within the two series in a differential pattern. Carbon isotopic fractionations indicated detectable shifts in the dietary patterns that are in accord with the dental pathology and general skeletal biology, indicating nutritious degradation of the foods consumed.

BONE MINERAL CONTENT IN PAST AND PRESENT (poster)

Pia Bennike, University of Copenhagen and H. Bohr, University Hospital, Copenhagen

In relation to studies of ethnic and geographical differences in osteoporosis, the bone mineral content (BMC) of bones from archaeological excavations (Neolithic, Viking, and Middle Ages) has been measured to obtain information on the pattern of osteoporosis in past populations. A 'Gammatec' dual photonabsorptiometry scanner with Gadolinium radiation source was used to measure the femoral shaft and neck. For comparison with recent material, bones from autopsy cases of known sex and age were also included. Results showed the highest values in the Neolithic and the lowest in the Viking Period and the Middle Ages. The average value of the recent material was between the values of the prehistoric populations. Sexual dimorphism was the same in all periods. A high correlation coefficient of the BMC of the right and left diaphysis and results from x-ray diffraction indicate that no serious postmortem damage of the mineral had occurred. An average ratio of inorganic/organic material of the bone was almost the same in all three prehistoric groups. The ratio showed high variations between individuals of the same group, probably because of diagenetic changes.

A CASE OF ACROMEGALY IN A PREHISTORIC SKELETON FROM THE SAN CRISTOBAL RUINS, NEW MEXICO (poster)

Jaymie L. Brauer, American Museum of Natural History

The endocrine disorder acromegaly has been diagnosed in an adult female skeleton from the late prehistoric period of San Cristobal Ruins, New Mexico. The skeleton exhibits many traits characteristic of acromegaly. The entire skeleton is extremely osteoporotic and arthritic; areas of tendon and ligament insertion on long bones show marked bone deposition. All available thoracic vertebrae show extreme proliferation of periosteal bone on the anterior portion of the vertebral body. Due to postmortem damage, the greatly enlarged frontal sinuses are visible. The pituitary fossa is enlarged and remodeled, and the intact posterior clinoid process is resorbed, suggesting the existence of a tumor. The mandible is large and elongated, with a massive bony build-up of the chin; the alveolar bone is very thin. A secondary mandibular fossa was created because of the disarticulation of the left condyle. The severity of the pathology suggests an advanced stage of development. This type of hormonal disturbance has rarely been reported within an archaeological context.

A PRELIMINARY METHOD FOR CALCULATING AND STORING OCCLUSAL SURFACE AREA (poster)

Wendy Bronson, University of California, San Diego and Anne Bogardt, San Diego State University

The goal of this project was to determine whether dental casts would serve in the transfer of three-dimensional information to two-dimensional surface in order to calculate the occlusal surface area of wear-flattened molars. The first step was to determine the accuracy of our dental casting technique by measuring the second molar diameters of originals and casts. A statistical analysis using the non-parametric procedure, Wilcoxon matched pairs signed-ranks test, indicated that there was no significant difference between original specimens and casts. The second step involved placing the casts with the occlusal surface down on the plate of a copy machine. Measurements of the 'xeroxed' second molars were found to be accurate. Using the paper copies, the perimeter of the occlusal surface of the second molars was digitized into a computer, and the area calculated to one tenth of a square millimeter, using the CalComp 2000 Series Digitizing Tablet. Problems and alternatives are addressed.

INTERNATIONAL CLASSIFICATION OF DISEASES (ICD-9) CODES FOR PALEOPATHOLOGY DATABASE (computer display and demonstration)

John B. Gregg, University of South Dakota

In attempting to formulate a comprehensive US paleopathology database, one problem encountered is the diversity of analyses and terminology used to report

abnormalities in skeletons and mummies. To promote accuracy and facilitate exchange of information, standard terminology and data encoding procedures are under study. In clinical medicine, the diverse terminology used to describe similar disease processes and abnormalities, plus the need for cost containment, forced the development of uniform data encoding procedures, leading to general adoption and use of standard ICD-9 codes. Findings from a large skeletal cohort from the Upper Missouri River Basin are computer encoded, pathology is described briefly along with diagnostic considerations, and it is possible to locate specific instances of pathology rapidly and easily. Occasionally, different terminology was used for similar pathological processes, so that applicable examples were not found on search. Encoding ICD-9 codes were added to the database, and with equivocal abnormalities, code numbers for diagnostic considerations were included: this increased both accuracy and efficiency. Adequate documentation of abnormalities in skeletons and mummies requires succinct, pithy 'clinical interpretations' accompanied by good photographs. When supplemented by ICD-9 codes, greater accuracy results, and data handling in the computer is enhanced.

PATTERNS OF TRAUMA IN HUMANS AND CHIMPANZEES

Robert Jurmain, San Jose State University

Patterns of traumatic injury are compared among two groups of free-ranging chimpanzees and a human skeletal series. One of the chimpanzee samples is the small skeletal collection (N=13) of well known individuals from Gombe National Park, and the other is a larger wild-shot series collected in the 1920s and 1930s from the Southern Cameroons (for crania, N=185, for post-crania, N=92). The human sample (N=440) derives from the prehistoric Central California Indian site, Ala-329, located on the eastern side of San Francisco Bay. In both humans and chimpanzees, traumatic injuries result most commonly from falls or from interpersonal violence. In both species, falls apparently result fairly often in fractures of the upper appendage, in chimps in the clavicle and forearm, but in the human sample presenting almost entirely in the forearm. Diagnostic parry fractures are found in both species as well. Cranial injuries vary between the two species, and are much more commonly seen in chimpanzees, affecting both adults and subadults. Finally, conflict-induced injuries also differ as the result of available weapons. In California Indians, projectile wounds are unusually frequent, and in chimpanzees bite wounds are commonly found.

A PALEOPATHOLOGICAL AND RADIOLOGICAL DIAGNOSIS OF TUBERCULOSIS ON THE PACIFIC NORTHWEST COAST

David A. Kice, University of Chicago

This paper presents a study of a series of skeletal remains from the Pacific Northwest coast of North America in the collections of the Field Museum of Natural History. The rare combination of a hunting gathering subsistence strategy

and sedentism seen in the Northwest created a unique disease environment, which was further affected by contact with European pathogens. A sample of 138 individuals from this series, representing members of the Haida, Nootka, Kwakiutl, and Coast Salish tribes, was examined for evidence of gross bony spinal pathology. Nine of these individuals showed evidence of resorptive pathological lesions of the vertebrae. In these nine individuals, the spinal lesions themselves were carefully analyzed and radiographed, and the exact pathological process described. Also, any additional areas of the skeletons of affected individuals involved in the pathological process were noted, and the age and sex distribution of the affected individuals within the population was established. When combined, this information led to a probable diagnosis of spinal tuberculosis in six of the individuals. This indicates a very high prevalence of the disease in the population at large.

HISTIOCYTOSIS IN CRETE? A POSSIBLE CASE FROM THE EARLY IRON AGE

Maria A. Liston, University of Tennessee

The partial skeleton of a 6-7 year old child excavated in 1989 at the early Iron Age village of Vronda at Kavousi, Crete exhibits multiple cranial lesions on the parietal and frontal bones that may be characteristic of histiocytosis. Radiographs of the skeleton also support this interpretation. The lesions apparently originate in the medullary bone and spread to both the inner and outer tables of the cranial bones. The lesions are rounded, lytic foci, with some beveling of the edges. Osteosclerosis of the surrounding bone is visible radiographically. There are no visible lesions on the postcranial skeleton, nor were any revealed radiographically. None of the other 125 skeletons from this site exhibit similar lesions.

EXEMPLARY ANOMALIES NOTED IN THE PREHISTORIC POPULATIONS OF THE EASTERN GREAT BASIN

Carol J. Loveland and John B. Gregg, Utah State University

During the spring and summer of 1990, 73 skeletons were recovered on the eastern shore of the Great Salt Lake in Utah. The remains, which probably date to between 400 and 1700 AD, represent two cultural periods, the Fremont and the Late Prehistoric. Two individuals exhibit exemplary abnormalities. Major portions of the skeleton of a 30-35 year old female are pitted with lesions attributed to a malignant neoplasm, possibly nasopharyngeal carcinoma. A second individual, a 35-40 year old male, suffered from contracture and ankylosis of the hip, possibly the result of tuberculosis. Report of these anomalies provides an understanding of prehistoric disease in the Great Basin, and extends our knowledge of the distribution of disease in ancient populations.

AN INITIAL ANALYSIS OF AN AMPUTATED LEG FROM SAN DIEGO MISSION DE ALCALA

Patricia Mitchell, ERC Environment and Energy Services, San Diego

A 1989 archaeological investigation at Mission San Diego de Alcala, San Diego, California uncovered an amputated leg that had been severed at mid-thigh. The limb, believed to be from the American Army period, was uncovered in situ with the metatarsals and phalanges resting on the cobble foundation of a Mexican period wall. A preliminary examination revealed that the leg belonged to a relatively tall, well muscled individual, approximately thirty-plus years of age. Bony spurs on the tarsal bones are consistent with an age over 30 years. Whether or not the individual survived the amputation is not known. In the 1800s, the mortality rate for amputations of this type was approximately 54%. The specimen was sent to the National Museum of Health and Medicine, Washington, DC for curation and further research.

PREHISTORIC MULTIPLE MYELOMA FROM THE EASTERN CENTRAL UNITED STATES

Sean P. Murphy, Murray K. Marks and Lee Meadows, University of Tennessee

The fragmented remains of an adult male (30 to 40 years old) were recovered from a looted Woodland period (500-900 AD) bluff shelter interment along a tributary in eastern Tennessee. Analysis revealed multiple circular lytic lesions on most skeletal elements. Lesion morphology and location are clinically consistent with plasma cell myeloma (also known as multiple myeloma). Also, age and sex fit the demographic profile for this disease. A specimen from an historically documented case of multiple myeloma was also examined in a comparative investigation of gross morphology. Using scanning electron microscopy, lesions from both specimens were examined, in an attempt to elevate the diagnostic power of the paleopathologist and generate a replicable protocol for lesion identification for future researchers.

THE PALEOEPIDEMIOLOGY OF INFLAMMATORY LESIONS AT CA-ALA-329 (poster)

Lorna C. Pierce and Robert Jurmain, San Jose State University

Ca-Ala-329 is a large shell mound located on the eastern border of the San Francisco Bay in central California. A sample of about 440 individuals excavated from the site was utilized in this study of non-specific infection. All osseous surfaces were examined for periosteal reaction and radiographs were utilized to determine the degree of involvement and the possible presence of underlying

trauma. The incidence of inflammatory reaction apparently unrelated to a primary traumatic event is quite low compared with other Native American prehistoric populations. Such a pattern may suggest a differently proportioned synergistic interaction among non-specific infectious agents, nutrition, and cultural factors than is observed in other populations.

WHY MUMMIES?

Plinio Prioreschi, Creighton University Medical School, Omaha, Nebraska

The preservation of the cadaver is a practice that goes back to remote antiquity, but it is not known why only certain societies mummified their dead. The author attempts to analyze the factors that may have contributed to the development of such a custom. Climatological factors do not seem to be essential, because mummification has been practiced in all climates. Social factors (e.g. the desire to preserve the bodies of the socially prominent) cannot be considered a sufficient determinant, as all societies have exalted members and most do not choose mummification to immortalize them. Paradigmatic factors (special beliefs concerning religion, etc.) seem to be the most important influence. Although climatological and social factors may sometimes have facilitated the development of this custom, it seems to be the paradigmatic elements that could have been necessary and perhaps even sufficient. This hypothesis is based on knowledge of the paradigms of only a few of the cultures that embalmed their dead; the beliefs of the others are either unknown or known only in a fragmentary way. One could speculate that paradigms similar to those that existed in these few societies may also have existed in all the cultures in which the practice occurred.

EROSIVE ARTHRITIS OF THE SPONDYLOARTHROPATHY VARIETY: DIAGNOSTIC CRITERIA BASED ON VIRGIN POPULATIONS

Bruce M. Rothschild, Robert J. Woods and Christine Rothschild, Arthritis Center of Northern Ohio and Northeast Ohio Universities College of Medicine

Shared characteristics and occurrence of rheumatoid arthritis and spondyloarthropathy in contemporary populations have compromised development of clear diagnostic criteria for distinguishing between them. Although modern populations contain individuals afflicted with both disorders, ancient populations often manifest only one. The fortuitous presence of spondyloarthropathy as the sole present erosive disease in many ancient populations allows further clarification of its nature. The tendency towards pauci-articular, asymmetrical involvement and to new bone formation, axial involvement, and peripheral joint fusion in these populations clarify diagnosis and distinguish this phenomenon from rheumatoid arthritis. The significance of peripheral joint fusion appears to be unequivocally established on the basis of these findings. The validity of these conclusions is further supported by their similarity to findings in contemporary skeletons (Todd Collection) and to notation in another population afflicted with spondyloarthropathy, African gorillas. An intriguing approach to analysis of the condition is to divide the affected

individuals into groups with pauci-articular and polyarticular disease. The distribution of pauci-articular and polyarticular joint disease is indistinguishable. Reproducibility of the nature and pattern of joint involvement in spondylo-arthropathy through time and across species lines documents just how powerful a tool population analysis contributes to the study of paleopathology.

STATUS OF THE REBURIAL MOVEMENT IN NEBRASKA: COOPERATION BETWEEN THE OMAHA TRIBE AND THE UNIVERSITY OF NEBRASKA

Karin L. Sandness and Karl J. Reinhard, University of Nebraska-Lincoln

The reburial controversy has been contentious in the state of Nebraska through the 1980s. In contrast to an established pattern of animosity between certain tribes and the Nebraska anthropological community, the University of Nebraska has enjoyed remarkably good relations with the Omaha people. This is due to the progressive nature of the Omaha Tribe and its cultural recovery and retention projects, which were first initiated in 1974. The reburial bill passed by the state legislature has been used by the Omaha as a vehicle to accomplish certain specific goals important to them, including the analysis of bones and associated artifacts. The Omaha wish to use the data gleaned from the remains to help reconstruct their lost history and certain aspects of cultural traditions. Although the progressive Omaha stand is currently unique, it may represent an emerging change in attitude among Native Americans towards reburial and scientific study. The details of the Nebraska reburial experience are discussed in this light.

CRIBRA ORBITALIA AND OTHER ABNORMALITIES IN A PLAINS WOODLAND SKELETON

John A. Williams, University of North Dakota

The Peter Lee Mound (21PL13) is a late Woodland cemetery located in northwestern Minnesota. Thirteen individuals were recovered from this cemetery, four adults and nine juveniles. One adolescent (13-16 years) is notable for the presence of bilateral cribra orbitalia. This spongy hypertrophy covered much of the superior wall of the orbits, and was active at the time of death. In addition, the infracranial skeleton displays a generalized osteoporosis. The spinal column is especially affected. The lumbar and lower thoracic vertebrae show evidence of compression. The five lumbar and first sacral vertebrae are fused and are laterally distorted. This is the first documented case of cribra orbitalia from the Northeastern Plains Woodland.

SECTION 2: SYMPOSIUM

OUR CHANGING ENVIRONMENT AS SEEN IN THE PALEOPATHOLOGICAL RECORD

Chairmen: John B. Gregg, University of South Dakota, M. Cassandra Hill, University of Massachusetts (Amherst), and John E. Molto, Lakehead University, Thunder Bay, Ontario

INTRODUCTION

M. Cassandra Hill, University of Massachusetts (Amherst)

Research in pathology can be divided into two basic types of analysis: clinical and biocultural. The clinical approach, primarily used by physicians, is one in which the pathological lesions of extinct individuals are examined through various media, and compared in a one-to-one manner to those of individuals, either living or recently dead, with a known clinical diagnosis. In instances where the lesions approximate each other, the researcher deduces that they share a similar diagnosis. The biocultural approach falls within the realm of epidemiology, and uses the clinical diagnosis of the abnormality as a starting point for an extended analysis of the presence of that particular disorder within an entire cultural system. Singular elements within the system that are felt to contribute to the existence of a disease are identified, and the intricacies of their interaction are explored. In this way, the analyst may be able to determine which factors contribute significantly to the maintenance of the pathological process within the population. The Paleopathology Association includes as members both physicians and biological anthropologists, including some with degrees in both disciplines. Participants in this symposium will explore both approaches in considering the contribution of environmental factors to the development of pathology.

PALEOEPIDEMIOLOGY, ENVIRONMENT, AND DISEASE

George J. Armelagos, University of Florida, and Alan H. Goodman and Debra Martin, Hampshire College

Paleoepidemiology provides paleopathology with a valuable research perspective. Paleoepidemiological models systematically consider the interaction of the environment, the population and the insult in the disease process. The model can be an effective tool in isolating disease causing insults. For example, the factors that produce anemia (as measured by porotic hyperostosis) can be isolated by the comparison of variables in the model. The paleoepidemiological models can also

be used to compare populations that have adapted to different non-cultural (biotic, climatic and physical) and cultural variables (technological, social and ideological) in the environment. Even political and economic factors are amenable for analysis.

A PREHISTORIC OCCUPATIONAL DISEASE? OSTEOLYSIS OF THE INTERIOR SPHENOID (poster)

Barbara A. Burnette and Melissa D. Bittinger, University of Arkansas

Seven prehistoric and protohistoric skeletal series from the mid-Ouachita region of Arkansas exhibit a disease previously unrecognized in the region. The pathological lesions involve the interior surfaces of the sphenoid greater wings. Similar lesions from prehistoric Peru have been associated with cribra cranii. None of the mid-Ouachita samples exhibit this lesion. All these Mid-Ouachita populations were salt producers. Although there are no current indications that salt production is toxic, our analysis does suggest a relationship.

ECOLOGICAL ASPECTS OF POROTIC HYPEROSTOSIS FROM EGYPT'S WESTERN DESERT

Scott I. Fairgrieve, University of Toronto and John E. Molto, Lakehead University, Thunder Bay, Ontario

When investigating possible sources of malnutrition in modern populations, an investigator is able to examine not only the food resources themselves, but also the method of preparation, storage techniques, amounts grown, dietary habits, and even the relative expense of dietary components. Until recently, the concept of being able to propose accurate dietary scenarios for past populations has been unrealistic. This paper will concentrate on the application of just such a methodology on the Roman Period inhabitants of the Dakhleh Oasis, Egypt. The skeletal sample in question exhibits an unusually high proportion of individuals affected with the orbital manifestation of porotic hyperostosis (cribra orbitalia). Utilizing a farm accounts book from the oasis, it is possible to investigate possible sources of anemic stress in the diet. This information is coupled with that provided by hydroxyproline levels in type I collagen from both bone and tooth. The tooth collagen provides a permanent record of nutritional information, and would indicate whether the stress was longstanding or not. All factors being considered, a more realistic picture of the possible etiology of porotic hyperostosis in this group is proposed.

PROTON-INDUCED X-RAY AND GAMMA EMISSION (PIXE, PIGE, MACRO- AND MICROPROBES) AND NEUTRON-ACTIVATED ANALYSIS (NAA) ON PATHOLOGICAL BONES

Nicole Boscher-Barré, Norbert Deschamps and Patrick Trocellier, CEA-CNRS, Laboratoire Pierre Süe, CEN-Saclay, and Joël Blondiaux, CRA-CNRS, Sophia Antipolis

Eleven femoral samples from two series in mediaeval Northern France and a modern sample have been submitted to proton-induced x-ray and gamma emission (PIXE, PIGE) macro- and microprobes, as well as to neutron-activated analysis (NAA), so as to compare the variations of several trace elements, variations that may be of pathological or diagenetic origin, knowing that both kinds can occur together. Results are presented for two cases of osteo-articular tuberculosis, one case of Pierre-Marie osteoarthropathy, and one of active porotic hyperostosis, against four reference samples without known pathology and one modern case (died in 1990 from myocardial infarction).

TRACE ELEMENT ANALYSIS OF ARCHAEOLOGICAL BONE: WOUNDED BUT NOT MORIBUND

Arthur C. Aufderheide, University of Minnesota-Duluth School of Medicine

In trace metal analysis of archaeological bone for purposes of chemical dietary reconstruction, recognition of the reality and frequency of ionic diagenetic contamination has converted an initial, probably inappropriately optimistic, expectation into a current, equally inappropriate, nihilistic attitude. The study reported involves more than 500 individuals from six cultural groups living on the north coast of Chile between 5000 BC and 1500 AD. An extremely broad range of dietary options of both terrestrial and marine origin was represented, as well as subsistence strategies . In spite of the absence of groundwater, some diagenesis occurred. Methods used to identify the contaminated bones are described. Identification of the persistence of characteristic fluctuations of bone strontium content in infancy was demonstrated. This 'universal internal standard' is suggested as a method to validate retention of the antemortem biogenic signal of strontium in human archaeological bone.

MEDIEVAL LIFE AND DEATH: ROCCA SAN SILVESTRO II

Grant Mullen and Kathy Gruspier, University of Toronto

Three additional seasons of excavation and analysis have been completed since the authors first reported on the medieval population from Rocca San Silvestro, Italy. Findings are as yet preliminary, but an overview of the lifeways of the people is emerging, and the eventual complete excavation of the cemetery will provide us

with a unique database from which to study the entire population. Aspects of both the health and socio-religious attitudes manifested in the skeletal population and its archaeological context are challenging preconceived notions about medieval society in general. Many of these discoveries can be explained by the geographic location, small size, and special purpose of the village, but others may represent transient or undocumented aspects of medieval society. Infectious disease, traumatic pathology, and those skeletal manifestations said to be indicative of dietary stress are surprisingly lacking in this population. A classic case of osteoporosis with concomitant pathological fractures and an intriguing metabolic disorder add to the pathological profile, which resembles a more modern pre-antibiotic population. Attitudes about death, which have been illuminated by the careful stratigraphic excavation of the site, serve to expand our knowledge of these people.

EVOLUTION OF PALEOPATHOLOGY IN THE UPPER MIDWESTERN UNITED STATES

John B. Gregg, University of South Dakota

Prompted by curiosity regarding racial disease pattern differences in the Upper Missouri River Basin, paleo-otorhinolaryngology came to fruition in the 1960s. Its genesis was in two intermeshed complementary activities, the Wet Bones and Dry Bones projects. Subsequently, research evolved to include abnormalities in the total skeleton. Results from these studies explain health care problems today, and provided fascinating insight into demography and epidemiology longitudinally. The region's ever changing milieu had tremendous impact on people who lived here previously and on what appeared in their mortal remnants. Recent changes in the socio-cultural environment, emphasizing 'repatriation' of human remnants and suppression of archaeology, especially if involving human burials, forewarned of problems in paleopathology. Data accumulation, preservation, and dissemination are our tools to preserve the past for the future.

COMPARATIVE PALEOEPIDEMIOLOGY OF DESERT POPULATIONS FROM THE DAKHLEH OASIS, EGYPT AND BAJA CALIFORNIA SUR, MEXICO

John E. Molto, Lakehead University, Thunder Bay, Ontario

This paper compares the paleoepidemiology of populations from the Dakhleh Oasis in Egypt's Western Desert and from the Cape Region of Baja California, Mexico. Both groups are adapted to desert ecozones, and each is relatively isolated from outside influences, with similarities juxtaposed against variant subsistence strategies. The Egyptians represent a complex, populous horticultural society, whereas the Cape People of Baja were a technologically impoverished, dispersed population with no pottery, basketry, or housing. These characteristics facilitate a research

design for addressing models of human adaptation to desert ecozones from the perspective of subsistence. Life expectancy at birth in each society was similar, and very low, reflecting their harsh environments. Their patterns of morbidity and mortality, revealed through analysis of infection, trauma, systemic disorders, and degenerative disease, differed significantly. The ecological correlates underscoring these epidemiological differences are examined in detail, and include palaeodietary data, resource information, and behavioral patterns between the populations. The differences, in general, do not support our traditional epidemiological paradigm for horticulturalists versus hunting, gathering, and fishing populations.

ENVIRONMENT, BEHAVIOR, AND PARASITISM: A BIOLOGICAL NEXUS IN ARCHAEOPARASITOLOGY

Karl J. Reinhard, University of Nebraska-Lincoln

Human parasitism can be related to natural environmental conditions and alterations in the environment due to human activity. These relations can be traced through parasitological study of archaeological remains. For ancient hunter-gatherers, conditions of the natural environment primarily determined what parasite species infected human populations. This is true of modern hunter-gatherers as well. For horticultural and pastoral peoples, human behavior led to alterations in the local environments surrounding habitations, or brought people into closer contact with zoonoses of domestic animals. Thus, zoonotic parasites, fecal-borne parasites, and parasites dependent on moist conditions proliferated among horticulturalists and pastoralists. Agriculture results in the greatest alteration of the environment due to intensive cultivation and urbanization. Archaeo-parasitological data indicate that many of the most common parasites of modern peoples arose as major parasites with the introduction of agriculture.

THE IMPOSSIBILITY OF DIAGNOSING OLD DISEASES

Ellis J. Neiburger, Waukegan, Illinois

Throughout history, man has been plagued by rapidly mutating diseases, which seem to evolve in adaptation to constantly changing environment and host conditions. Many of these diseases are distinct, but exhibit similar signs and symptoms, leading to misclassification on the basis of modern diagnostic criteria. What appear as modern syphilis, tuberculosis, cancer, etc. in ancient remains have thus been identified and misdiagnosed as examples of modern disease. There is a great danger of scientific abuse in today's custom of specifically classifying ancient disease based on terminology and criteria occurring in modern disease states. So many new diseases have appeared, radically evolved, and disappeared over man's history that the statistical probability of the modern existence of an ancient disease is nil. Statistical examples of rapid retroviral and bacterial pathogen changes are used to support the thesis that what you see in ancient specimens does not now exist, and any definitive diagnosis has a high probability

of error. I suggest that the diagnosis for most paleopathological specimens be limited to general descriptions rather than being identified as actual disease states.

PANEL DISCUSSION

Donald Chrisman, Yale University School of Medicine and University of Massachusetts (Amherst), Donald J. Ortner, Smithsonian Institution, Bruce D. Rothschild, Arthritis Center of Northeast Ohio, and David S. Weaver, Wake Forest University

The consensus of the panel members was that there was a place for both clinical and biocultural approaches in the study of pathology, particularly in individuals and populations from the past. Drs Ortner and Rothschild pointed out that an accurate diagnosis is very important in examining a particular disease history. Referring to theoretical issues in archaeology, Dr Weaver commented that paleopathologists should be aware of the limitations on accurate diagnosis and complete reconstruction of past environments, given the absence of the entire individual (the hard tissues are present, but the soft tissues are almost always absent), and without recovery of elements of an entire ecological system. Dr Chrisman noted that work such as that by Dr Reinhard is important, because parasites are perhaps the only actual remains that we have of portions of the disease loads of past populations.

(Reported by M. Cassandra Hill)

SECTION 3: WORKSHOP

INFLUENCES ALTERING BONE DENSITY

Bruce D. Ragsdale, Arizona State University and Donald J. Ortner, Smithsonian Institution

The mechanisms operative in skeletal disease are aberrations of normal biology, and bone has a limited number of ways in which it can react. This leads to difficulty in diagnosing specific diseases through direct examination and radiography of dry bone specimens, unless disease mechanisms are clearly understood and an analytical morphologic approach is employed.

Workshops I (What's in the Hole?) and II (What's on the Bump?) emphasized understanding the soft tissue/bone interfaces responsible for morphologic changes. Workshop III (Causes of Bone Density Change) presents the view that a focal, regional, or generalized reduction of bone density (e.g. a 'hole' or osteopenia) occurs only through the sustained overriding action of osteoclasts; focal, regional, or generalized gain in bone density (e.g. a 'bump' or exuberant periosteal reaction) occurs only through the sustained predominant action of osteoblasts. Which cell activity predominates is explainable as due to one or more of three influences: altered circulation, metabolic factors, and mechanical stress.

There are only seven categories of disease: Vascular (Circulatory), Neoplasia, Inflammatory/Immune, Trauma/Repair, Anomaly (Congenital), Metabolic, and Neuromechanical. Each has distinctive hallmarks in dry bone specimens. Differential diagnosis with these seven possibilities in mind rather than several thousand specific diseases is a powerful tool for the paleopathologist.

Morphologic analysis of periosteal alterations, margins and density changes (e.g. sclerosis or deletion of cancellous bone or cortex, and the pattern of the change) is an organized method used regularly by modern diagnosticians (ref: Radiologic Clinics of North America, 1981, 19:715-814). Because it is a non-histological method, based on gross observation and radiologic data, its techniques and terminology are applicable to paleopathology. For example, attention to three parameters (margins, periosteal reactions, matrix patterns) permits a diagnositic accuracy in excess of 90% for bone tumors. The technique will usually refine an 'Inflammatory category' diagnosis into one of the three types of skeletal inflammation: septic, granulomatous, or angiitic. Post-traumatic and some metabolic (e.g. hyperparathyroid bone disease) changes are likewise succinctly described by this method.

The application of molecular biology techniques in paleopathology has brought occasional exceptions to a major obstacle: paleopathologic diagnosis is the province of opinion rather than verifiable fact. A side issue emerging from the workshops has been the value of maceration prepared from modern examples

of known skeletal disease in quantifying diagnostic accuracy. This is analogous to the increasingly stressed Quality Assurance effort operative throughout all branches of medicine. In pathology, body fluids and tissue samples with known levels of specific substances or known diagnoses are distributed nationwide from authoritative sources such as the College of American Pathologists: these and periodic inspections are the basis for continuing certification of proficiency.

In the workshops, a simple point system of scoring (facilitated by Elizabeth Miller) was applied to determine the accuracy of discerning: 1) disease category; and 2) specific disease entity as exemplified by modern macerates. Known disease examples out for study in Milwaukee included avascular necrosis (femoral head), osteoarthritis, neuropathic ankle joint, rheumatoid arthritis (ulna, radius, femoral head), septic joint (finger), osteoid osteoma (femur), reflex sympathetic dystrophy (leg), and the femur/tibia of a 57 year old retarded male who never walked. Smithsonian specimens from antiquity included examples of anomalous and metabolic dwarfism, illustrating that less than normal skeletal mass and/or density may have anomalous (congenital) or endocrine explanations. The accuracy results for the 2-4 member workshop teams of 1990 and 1991 are tabulated below.

Diagnostic Accuracy - Hospital Derived Macerates Only

Year	Number of: Groups	Number of: Cases	Percentage of groups giving correct specimen diagnosis as to: Disease category	Percentage of groups giving correct specimen diagnosis as to: Specific disease	Chi-square Correlation
1990	10	10	60%	40%	7.2
1991	11	10	20%	24%	1.4

These workshops on bone lesions demonstrate the difficulty in diagnosing specific conditions on the basis of dry bone inspection and specimen radiographs alone. The difference in diagnostic accuracy between 1990 and 1991 is attributed to use of more challenging specimens in 1991, rather than a deterioration of skills in workshop veterans. The fact that the basic disease category is correctly identified more often than the specific disease was obscured somewhat in 1991 by participant classification of three correctly diagnosed rheumatoid arthritis specimens (of the ten total) into categories other than Inflammatory/Immune. Paleopathologists might consider prefacing their specific diagnosis on human skeletal remains with the less ambitious but more often correct disease category.

SECTION 4: DEMONSTRATIONS AND DISCUSSIONS

CASTING TECHNIQUES

Virginia Ridgway, San Diego Museum of Man
Assistants: Wendy Bronson, Juliana Gay, Patricia Mitchell, Leon Pappanastos and Rose Tyson

The idea for this 'hands-on' workshop, in which casting methods using dental alginate and lab stone were demonstrated, was prompted by the federal law of 16 November 1990. (This is the law that makes Native American skeletal remains in federally funded institutions subject to reburial.) There were 18 participants, with experience ranging from beginners to practicing dentists, so that the students learned not only from the instructor but from each other. After the introduction and a short demonstration, the class broke up into small groups, everyone swathed in plastic aprons, to try their own hands at casting. Mandibles, pubic symphyses, and articular surfaces of the tibia were provided, as well as pails, vibrators, casting materials -- and a plentiful supply of water. The classroom began to take on somewhat the atmosphere of a play school, but at the end of two hours, as the beginners gained confidence, there was a real sense of accomplishment and pride. As well as the opportunity to practice under expert supervision, the participants were provided with a four page instruction sheet and a list of materials and prices: this has since been supplemented by a collection of tips from Ellis J. Neiburger, who has had a number of years experience in the field. PPA members who were not able to attend the demonstration/workshop can at least obtain a copy of this written material: just write to V. Ridgway, San Diego Museum of Man, 1350 El Prado, Balboa Park, San Diego, CA 92101.

CRANIOSYNOSTOSES

Sheilagh Brooks and Richard H. Brooks, University of Nevada

There are many types of craniosynostoses, but simple scaphocephaly, with no complications, has been most frequently recorded in human skeletal remains. Other more severe kinds of craniosynostoses involve mental retardation with several genetically related side effects, and these individuals seldom survive to adulthood. This may be the reason that they are not often encountered in skeletal collections. Slides of the Breda cranium and other scaphocephalic cases from the literature were presented to illustrate the simple types of craniosynostoses. The Breda cranium is from a medieval skeletal collection, which is housed in the Osteo-Anthropology Department, Rijksuniversiteit Utrecht, The Netherlands (director: Rutger Perizonius). Further discussion concerned the more complex types of premature cranial suture closure and their genetic side effects. Questions were raised as to

how to identify the side effects, especially when incomplete skeletons are involved. These more complex types of craniosynostoses include acrocephaly, plagiocephaly, and other premature closure of cranial sutures, with some discussion of Moss's proposal that the dural fibers can affect suture closure. A major result of the round table was Dr John Kolar's proposal to hold a craniosynostoses workshop at the next PPA meeting, with participants bringing specimens for diagnosis and discussion. This should prove most productive for the 1992 meeting in Las Vegas.

BONE PATHOLOGY IN BLACK AND WHITE

Morrie R. Kricun, University of Pennsylvania

Understanding the radiographic patterns of disease and the pathophysiology of radiographic signs aids in the diagnosis and differential diagnosis of bone disorders. Radiography may be helpful in the evaluation of bone abnormalities observed in dry specimens, such as abnormalities in contour (i.e. healed fracture vs bone lesion). Radiographic evaluation may also help in the discovery of abnormalities within bone that might otherwise go unrecognized (growth recovery lines, osteosclerotic disorders, some bone replacement disorders such as metastasis or myeloma). It should be recalled that significant cancellous bone must be destroyed before a lesion can be visible radiographically, but less cortical bone has to be destroyed to be detected on the radiograph. In addition, postmortem defects and weathering changes may alter the radiographic appearance. The radiograph also aids in the evaluation of the response of bone to an underlying process. This presentation (of more than 200 slides, plus some dry specimens) reviewed sclerotic disorders, osteopenic disorders, arthritides, spinal disorders, metabolic diseases, congenital malformation syndromes, trauma, and infection of bone.

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