

Lille, France

August 27 - 29, 2012

**The 19th european
meeting of the
paleopathology
association**

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Two fields of research frequently contribute to the development of paleopathology - the socio-cultural sciences and medical sciences. In the sociocultural sciences research is usually undertaken in laboratories and departments devoted to the humanities, while in the medical sciences research is typically within located medical schools. These two types of research, and the differing philosophical concepts behind them, can lead to ideological conflict, as the contributions of both fields to paleopathology are unbalanced. The medical sciences have the benefit of understanding the lesions caused by disease in humans, and the symptoms of those diseases recorded in written texts from the past. Conversely, the anthropological sciences have the benefit of understanding the archaeological context of the material under investigation, and the cultural context of the past population in question. However, the contribution of paleopathology to both fields seems to favour the anthropological sciences, as most paleopathology articles are published by anthropologists and bioarchaeologists in anthropological journals.

We deeply believe that paleopathology is an autonomous science to which medicine and bioarchaeology should be equal contributors and beneficiaries. This is why we are so pleased to hold the 19th European Conference of the Paleopathology Association in the precincts of the Palais des Beaux Arts of Lille (lectures, papers and poster exhibitions) and in the «Département d'Anatomie» of the Faculté de Médecine, Université Lille Nord de France (workshops). The success of the 2010 Vienna meeting hosted in the prestigious Natural History Museum by Pr Maria Teschler-Nicola and her team boosts our determination for an equivalent standard of program preparation and meeting organization. We hope too that the nationally recognized welcoming nature of the people of northern France (Ch'tis) will provide participants with a friendly and convivial environment for their conference.

Joël BLONDIAUX
Centre d'Etudes Paléopathologiques du Nord, France.

TRIBUTE TO PROFESSOR DONALD J. ORTNER.

Occasionally in life we meet someone of quite extraordinary talent, who is making an outstanding contribution to knowledge, scholarship, and the enrichment of life. Charlotte Roberts and I met such a man in Don Ortner at the Palaeopathology Association European Meeting in Madrid in 1986. Sadly, Don died on April 29th 2012 after a short, but fulminating, illness. He died having achieved more than most of us do in our entire lifetime, but he was not in the fullness of his years.

Don and Joyce and their family became very dear friends of my wife Ann and me, and our family, and have been so for the past 26 years. It is therefore my honour to give this tribute to Don.

When Charlotte and I met him, he told us that he would like a hook to hang his coat on in Britain, and to undertake research. I suggested that the University of Bradford might be a suitable venue, and he eagerly accepted. The University appointed him to an Honorary Visiting Professorship in the Department of Archaeological Sciences, and so started a long, happy, and mutually fruitful relationship between Don, The Smithsonian Institution, and the University of Bradford. As a measure of the respect and gratitude which the University felt towards Don, he was awarded an Honorary Doctorate of Science of the University.

Don and Joyce made annual visits to the University, staying for periods of up to 3 months to become integrated in the undergraduate and postgraduate teaching programmes in osteology and palaeopathology, and to undertake palaeopathological research. His contribution to both aspects was immense and highly valued and appreciated by our students, some of whom subsequently had student attachments within The Smithsonian, under Don's tutelage and supervision. Wherever he was, he gave freely of his time and advice to students and fellow academics alike, explaining often quite complex palaeopathological matters in a succinct and intelligible way. He instilled in all, the absolute need for accurate description in palaeopathology. He advised strongly against over-diagnosis, and always stressed the importance of an understanding of pathogenesis of palaeopathological lesions. Although he and I frequently had friendly academic disagreements, in these tenets we were of one accord.

During his 26 years of academic association with the University, he, with Charlotte's assistance, organised the, now famous, Short Courses at Bradford. He coerced local, national, and international experts into teaching on the Courses which became extremely popular, with worldwide participation. A component of the Courses, which was not scheduled but developed ad hoc, became known as Don and Keiths' Pony Show. He and I would discuss and disagree on diagnosis in a specific specimen; he would insist on diagnosis A and I would insist on diagnosis B, and neither of us would give an inch. A year or two later at the next Short Course, the same specimen would be placed before us. He would insist on diagnosis B and I on diagnosis A. Thus, we were both correct, albeit at different times!

I think that, as a result of my long obsession with the palaeopathology of leprosy, and the curation at Bradford of the Chichester Leprosarium skeletons, Don also became quite obsessed with leprosy, and he contributed much to the corpus of current knowledge.

Don's publication record is immense, and the crowning glory was his book "Identification of Pathological Conditions in Human Skeletal Remains". A new edition was in preparation, and he honoured me by asking me to write the Forward to the volume. This has now all halted, but my personal hope is that someone will adopt the mantle and see it through to completion for him. He deserves it, but if anyone is brave enough to do so, they had better watch out because Don will be "sitting on high" keeping a close watching brief.

Aside from academe, Don and Joyce, although American, were consummate Yorkshire Folk. In due course, Charlotte even provided them with Yorkshire passports of which they were very proud. Many a time Ann and I have been walking with them in the Yorkshire Dales, and waited whilst Don leaned on a dry stone wall to moo at a herd of cows. So fond was he of these animals that one cold

morning the four of us were walking in Coverdale, and he stood in his wellies in a fresh steaming cow pat to warm his feet. He bought a sheep whistle which he was even known to blow in an academic meeting to draw his audience to heel. His favourite dog was the Border Collie, and he and Joyce had two such friends in Washington, and he delighted in attending Yorkshire sheep dog trials. Given time, I can imagine him in a flat cap and Barbour jacket taking part.

In our family, Ann's aged Lancastrian Aunt Lou addressed Don as "that big bug from America". He delighted in that, and often assumed the title when speaking at academic events. He was not proud, and he was not what Aunt Lou would have called highfalutin. He was an ordinary quite extraordinary man.

Don was a good friend, one of the best, to us all. He was a scholar without equal. He was a good and devoted family man, with a very devoted, supportive, and, if I may say so, extremely patient wife Joyce. He was a truly honest and honourable man, and the quintessential gentleman.

His life was untimely ended, but I thank God for having known him and for being privileged with his friendship.

Keith Manchester
Division of Archaeological Sciences,
University of Bradford
2012

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PROGRAM

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ORAL COMMUNICATIONS

MONDAY, 27TH AUGUST, 2012

8.00 am Welcome in Palais des Beaux Arts

9:00 am Opening speech by Joël Blondiaux, Scientific Manager of the 19th European meeting
Introduction by Charlotte Roberts, President of the paleopathology association
Tribute to Donald Ortner by Keith Manchester

9.30 am **METHODOLOGY SESSION**

Chairmen : Gyorgy PALFI (Szeged, Hungary) – Israel HERSHKOVITZ (Tel Aviv, Israel)

- **Computer Tomography-based Differential Diagnosis: It is not what it looks like**

Julia Abramov, Nathan Peled, Viviane Slon, Tatiana Sella-Tunis, Michal Feldman, Israel Herskovitz

- **VIRCOPAL® (VIRtual COllection of PALeo-specimens): 3D ressources for teaching and research in Paleopathology**

Hélène Coqueugniot, Bruno Dutailly, Pascal Desbarats, Olivier Dutour

- **The use of Peripheral quantitative computed tomography (pQCT) in archaeology: the study of skeletal characteristics in 16th to 19th century children in Finland**

Kati Salo, Outi Mäkitie, Heli Viljakainen, Sanna Toiviainen-Salo

- **Ultra-structural evaluation of cremated teeth using small and wide-angle x-ray scattering (SAXS/WAXS)**

Michael Sandholzer, Tan Sui, Alexander M. Korsunsky, Maria Teschler-Nicola, Gabriel Landini

- **A multidisciplinary approach to the study of ancient renal stones**

Luca Ventura, Lorenzo Arrizza, Mattia Capulli, Raimondo Quaresima, Valentina Giuffra, Anna Teti, Gino Fornaciari

10:45 am MORNING BREAK

11:15 am **Plenary Lecture: Anne GRAUER (Chicago, USA)**

11:45 am **INFECTIOLOGY SESSION**

Chairmen : Charlotte ROBERTS (Durham, United Kingdom), Niels LYNNERUP (Copenhagen, Denmark)

- **Evidence for Tuberculosis at Chirikof Island, Alaska, during the Fur Trade**

Dela Collins Cook

- **Pre-Columbian Treponematosi from Roca Vecchia (Lecce, Italy)**

Gino Fornaciari, Valentina Giuffra, Simona Minozzi, Lucio Calcagnile, Pier Francesco Fabbri

- **The evolution of tuberculosis in the Pleistocene. Where is the evidence for any human involvement?**

David E Minnikin, Oona Y-C Lee, Gurdyal S. Besra, Bruce Rothschild, Richard Laub, Mark Spigelman, Helen Donoghue

- **The Early Mediaeval Manor at Gars/Thunau (Lower Austria): a Region of Endemic Tuberculosis?**

Maria Teschler-Nicola, Friederike Novotny, Michaela Spannagl-Steiner, Johanna Irrgeher, Thomas Prohaska, Kerstin Rumpelmayr, Eva-Maria Wild, Barbara Däubel, Elisabeth Haring

00:45 pm LUNCH BREAK

02:00 pm **PARASITOLOGY SESSION**

Chairman : Piers MITCHELL (Cambridge, United Kingdom)

- **Simplifying the process for extracting parasitic worm eggs from cesspool sediments: a trial comparing the efficacy of widely used techniques for disaggregation**

Evilena Anastasiou, Piers D Mitchell

- **Studies on human health and disease based on paleoparasitological examination of archaeological specimens from Korea**

Dong Hoon Shin, Chang Seok Oh, Myeung Ju Kim, Yi-Seok Kim, Soong Deok Lee, Min Seo

- **Paleogenetic and Paleoparasitological analysis of 17th-19th century human remains from Rio de Janeiro, Brazil**

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Lauren Hubert Jaeger, Ondemar Dias Neto, Alena Mayo Iñiguez

- **Trichurid ova: are they always *Trichuris trichiura*?**

Andrew K. G. Jones

- **Recovery of helminth eggs from First World War German trench latrines in France**

Matthieu Le Bailly, Michaël Landolt, Françoise Bouchet

- **Human Intestinal Parasites from a Latrine in the 12th Century Crusader Castle of Saranda Kolones in Cyprus**

Piers D. Mitchell, Evilena Anastasiou

- **A paleoparasitological study of the ancient salt miners in Chehrabad (Northwestern Iran)**

M. Nezamabadi, A. Aali, T. Stöllner, Matthieu Le Bailly

03:45 pm AFTERNOON BREAK

04:15 pm **DNA SESSION**

Chairmen : Gino FORNACIARI (Pisa, Italy) - Andreas NERLICH (Munich, Germany)

- **A draft genome of *Yersinia pestis* from victims of the Black Death**

Kirsten I. Bos, Verena J. Schueneman, Hendrik N. Poinar, Johannes Krause

- **Ancient-DNA reveals an Asian type of *M. leprae* in medieval Scandinavia**

Christos Economou, Anna Kjellström, Kerstin Lidén, Ioannis Panagopoulos

- **Molecular detection and identification of *Mycobacterium tuberculosis* in an early Bronze age skeleton from Tell es-Sultan, Ancient Jericho**

Suheir Ereqat, Gila Kahila Bar-Gal, Abedelmajeed Nasereddin, Charles L. Greenblatt, Kifaya Azmi, Issa Sarie, Mark Speiglmán, Ziad Abdeen

- **Isolation and characterization of viral nucleic acid sequences from ancient, human naturally mummified soft tissue**

Michal Feldman, Rina Arbesfeld, Israel HersHKovitz, Hila May, Tatiana Sella-Tunis, Julia Abramov, Ildiko Pap, Ella Sklan

- **Biomarker evidence for ancient tuberculosis in the so-called “Fertile-Crescent”. Is this the location of the oldest cases of human disease?**

Oona Y-C Lee, David E Minnikin, Gurdyal S Besra, Oussama Baker, Olivier Dutour, Suheir Ereqat, Mark Spigelman

- **Rib lesions in Neolithic and Early Bronze Age populations from Central Germany – Indications for a diachronic change in the health status?**

Nicole Nicklisch, Frank Maixner, Angelina Siebert, Robert Ganslmeier, Susanne Friederich, Albert Zink, Kurt W. Alt

- **Tuberculosis in a late medieval osteoarchaeological series and in two paleolithic specimens from Hungary: morphological and paleomicrobial results**

György Pálfi, Ildiko Pap, A. Pósa, Zsolt Bereczki, Erika Molnár, Olivier Dutour, P. Perrin, Anne-Marie Tillier, Frank Maixner, Albert Zink

06:00 pm **MISCELLANEOUS**

- **The Fifth Lumbar Vertebra of Galileo Galilei in Padua University**

Alberto Zanatta, Gaetano Thiene, Guido Liessi, Cristina Basso, Cesare Barbieri, Maurizio Ripa Bonati, Fabio Zampieri

06.15 pm End of sessions

TUESDAY, 28TH AUGUST, 2012**8.00 am** Welcome in Palais des Beaux Arts**8:30 am** **TRAUMA AND STRESS MARKERS SESSION***Chairmen* : Rimantas JANKAUSKAS (Vilnius, Lithuania) – Alexandra BUZHILOVA (Moscow, Russia)**- Two cases of perimortem lesions of Upper Paleolithic individuals from Sunghir, Russia**

Alexandra Buzhilova

- Ancient reliefs, bone trauma and present forensic case shed light on the Assyrian army brutality

Haim Cohen, Viviane Slon, Alon Barash, Hila May, Bahaa Medlej, Michal Feldman, Israel Hershkovitz

- Assessing post-traumatic survival time in human dry bone

Hans de Boer, Lida Van der Merwe, Maryna Steyn, George Maat

- Women and children first: Violence and division of labour in Neolithic Europe

Linda Fibiger

- The Analysis of Long Bone Fractures and Dislocations in 14th-17th century Alytus, Lithuania

Justina Kozakaite

- A Forensic Approach to Medieval Gunshot Trauma

Rachel Schats, Andrea Waters-Rist, Rob Hermsen, Amalia Stamouli, Gareth Davies, Menno Hoogland

- Using Femoral Head and Neck Lesions to Predict Habitual Activities in Ancient Populations

Bahaa Medlej, Janan Abbas, Hila May, Gali Dar, Dan Stein, Haim Cohen, Israel Hershkovitz

- Activity-related morphologies and the sexual division of labor during the Early Neolithic

Sébastien Villotte, C.J. Knüsel

10:30 am MORNING BREAK**11:00 am** Plenary lecture : Franck RÜHLI (Zurich, Switzerland)**11:30 am** **STABLE ISOTOPES SESSION***Chairmen* : Anastasia PAPATHANASIOU (Athens, Greece) – Estelle HERRSHER (Aix-en-Provence, France)**- Project Petersberg – A Stable Isotope Study Of A Medieval Population In Southern Bavaria (Germany)**

Sandra Lössch, Ulrich Struck, Albert Zink, Thomas Meier

- Diet Reconstruction with Stable Isotope Analysis of Human Skeletal Remains of the Early, Iron Age site, Agios Dimitrios in Central Greece

Eleni Panagiotopoulou, Anastasia Papathanasiou, Konstantinos Mpeltisios

- Study of a mortality crisis in the catacomb of Saints Peter and Marcellinus, Rome (1st-3rd century AD): Assessment of biological affinities of the population through morphological dental traits and stable isotope analysis ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$, $\delta^{18}\text{O}$)

Kevin Salesse, Élise Dufour, Chris Wurster, Jaroslav Bruzek, Raffaella Giuliani, Dominique Castex

- Health, diet and gender – patterns of complex identity in early medieval Pleidelsheim

Holger Schutkowski, Nivien Speith

- Dietary complexity in Bronze Age Italy: the isotopic evidence

Mary Anne Tafuri, Michele Cupitò, Luciano Salzani, Jacopo Moggi Cecchi, Alessandra Varalli, Alessandro Canci

00:45 pm LUNCH BREAK**02:00 pm** **POPULATION, EPIDEMIOLOGY SESSION***Chairmen* : Jane E. BUIKSTRA (Tempe, USA) - Maria TESCHLER-NICOLA (Vienna, Austria)**- In the wake of the Black Death - increased well-being for the survivors?**

Caroline Arcini

- Women to the left, please! Human skeletal remains from the late mesolithic site of Nivå 10 in eastern Denmark

Pia Bennike

- Quinto Tiberio Angelerio (1532-1617): New Rules and Control of Plague Epidemics in 16th Century Algher (Sardinia)

Rafaella Bianucci, Ole JØrgen Benedictow, Gino Fornaciari, Valentina Giuffra

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- **Small Town Life - Health Stress in Post-Medieval Durham, North-East England, U.K.**

Tina Jakob

- **Past Populations Predicting the Future of Human Health: the Case of Hyperostosis Frontalis Interna**
Hila May, Gali Dar, Dan Stein, Janan Abbas, Israel Hershkovitz, Nathan Peled

- **Damabarare, Zimbabwe: A preliminary report on the skeletal remains of its 17th century inhabitants**
Elaine Swanepoel, Maryna Steyn

- **Rural rickets. Beemster, a farming community in post-medieval Netherlands**

Barbara Veselka, Andrea Waters-Rist, Menno L.P. Hoogland

03:45 pm AFTERNOON BREAK

04:15 pm **ODONTOLOGY SESSION**

Chairmen : Emma RABINO-MASSA (Torino, Italy) - Ana Luisa SANTOS (Coimbra, Portugal)

- **How serious is the impact of the method of timing estimation of linear enamel hypoplasias on the results of a study?**

Marta Krenz-Niedbała, S. Łukasik

- **Treponema denticola – a causative agent of periodontitis detected in tissue biopsies of the Iceman**
Frank Maixner, Anton Thomma, Stefanie Widder, Thomas Rattei, Albert Zink

- **Dental Chipping in the Middle Iron Age Population from Lithuania: Sexual and Social Differences**
Žydrūnė Miliauskienė, Rimantas Jankauskas

- **Periodontitis of the Neolithic Iceman (3300 B.C): clinical aspects and aetiological considerations**
Roger Seiler, Albert Zink, Frank Rühli

05:15 pm **MISCELLANEOUS**

Chairmen : Pia BENNIKE (Copenhagen, Denmark - Caroline POLET (Bruxelles, Belgique)

- **Cranial surgery of the Avar Age (7-9th century AD) in the Great Hungarian Plain**

Zsolt Bereczki, Erika Molnár, László Paja, Antónia Marcsik, György Pálfi

- **Numerous cases of hip dysplasia in a population of VIIIth century (Chéméré, West of France)**

Véronique Gallien, Yves Darton, Luc Buchet

- **Qafzeh 11 adolescent skull from layer XXIII (dated to 92 ± 5 ka BP): paleopathological reappraisal using 3D reconstructions**

Anne-Marie Tillier, Hélène Coqueugniot, Baruch Arensburg, Olivier Dutour

- **Osteological Evidence of Achondroplastic Dwarfism in a Nineteenth Century Dutch Family**

Andrea L. Waters-Rist, Menno L. P. Hoogland

- **Insect artifacts on Human bones in archaeological contexts: Osteophagy vs paleopathology**

Jean-Bernard Huchet

06.15 pm End of sessions

08.00 pm OFFICIAL RECEPTION

WEDNESDAY, 29TH AUGUST, 2012

8.00 am Welcome in Palais des Beaux Arts

8:30 am **MUMMY STUDIES SESSION**

Chairmen : Albert ZINK (Bolzano, Italy)– Joaquim BAXARIAS (Barcelona, Spain)

- **Early and late anthropic intentional traces in Egyptian dynastic mummies**

J. Baxarias , V. Fontaine , E. Garcia-Guixé , M. Nuñez , J. Herrerin, R. Dinares

- **Mummification practices on human remains found at the tomb of Panhesi (TT16): post mortem surgery and prosthesis for the after life**

Esus Herrerin, Miguel A. Sánchez, Suzanne Onstein, Virginia Reckard, Elizabeth Warkentin.

- **A possible case of Cherubism in a 17th-century Korean female mummy**

Israel HersHKovitz, Mark Spigelman, Do-Sun Lim, In Sun Lee, Chang Seok Oh, Hila May, Elisabetta Boaretto, Yi-Suk Kim, Soong Deok Lee, Nathan Peled, Myeung Ju Kim, Talya Toledano, Gila Kahila Bar-Gal, Dong Hoon Shin
- **Chemical, Radiological and Histological Investigations of Mediaeval Mummified Brains Found in Belgium**
Karl Link, Christina Papageorgopoulou, Ursula Gutteck, Daniel Müller, Frank Rühli, Marie-Laure Van Hove, Raffaella Bianucci

- **Revisiting the Tres Ventanas Caves Mummies in Peru: Oldest in the World?**

Guido P. Lombardi

- **Molecular identification of infectious pathogens from ancient Egyptian mummies: co-infections with tuberculosis and malaria**

Andreas Nerlich

- **Paleoradiology of the Savoca Mummies, Messina, Sicily**

Dario Piombino-Mascali, Stephanie Panzer, Wilfried Rosendahl, Mario Sergio Todesco, Arthur C. Aufderheide, Albert R. Zink

- **The Chehr Abad Salt Men (1,500-2,500 BP) – a multidisciplinary mummy research project**

Franck Rühli, A. Abar, A. Ali, D. Brothwell, M. Pollard, T. Stöllner

10:30 am MORNING BREAK

11:00 am Plenary lecture : Olivier DUTOUR (Bordeaux, France)

11:30 am **PALEO-RHEUMATOLOGY SESSION**

Chairmen : George MAAT (Leiden, The Netherlands) - Sherry FOX (Athens, Greece)

- **Erosions in the Spotlight: A Revision of the Evidence for Rheumatoid Arthritis**

Davina Craps

- **Schmorl's nodes distribution in the human spine – a skeletal study**

Gali Dar, Youssef Masharawi, Smadar Peleg, Nili Steinberg, Hila May, Bahaa Medlej, Nathan Peled, Israel HersHKovitz

- **Facet joint subluxation indicating possible disc herniation in juvenile Homo erectus skeleton**

Martin Haeusler, Regula Schiess, Thomas Boeni

- **Ankyloses of the spine in Hungarian skeletal series – characteristics and differential diagnosis**

László Paja, Hélène Coqueugnot, András Palkó, Olivier Dutour, György Pálfi

- **Vertebral Morphology an Aetiological Factor for Schmorl's Nodes at the Thoraco-Lumbar Junction and Lumbar Spine**

Kimberly A. Plomp, Charlotte A. Roberts, U. Strand Viðarsdóttir

- **The "Cave of the Warrior" Revisited - Differential Diagnosis for the Unilateral Endocranial Thickening of a 6,000 years old Skull**

Viviane Slon, Haim Cohen, Julia Abramov, Tatiana Sella-Tunis, Israel HersHKovitz, Nathan Peled

- **What does the epiphyseal ring tell us about spinal diseases in general and intervertebral disc pathologies in particular in ancient populations?**

Dan Stein, Viviane Slon, Janan Abbas, Haim Cohen, Tatiana Sella-Tunis, Israel HersHKovitz

01.15 pm Cockburn Award Ceremony

01.30 pm LUNCH BREAK

02.45 pm **WORKSHOPS**

- **War casualties (Laboratoire d'Anatomie de Lille)**

- **Leprosy (Laboratoire d'Anatomie de Lille)**

- **Bone porosities: growth or pathology? (Direction de l'Archéologie Préventive de la Communauté d'Agglomération du Douaisis)**

- **Mummy studies of Antinoë (Palais des Beaux Arts)**

06.15 pm End of sessions

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POSTERS

Posters are grouped by topic and scheduled as close in time to the corresponding oral session as possible. Posters will be displayed in the coffee break room during a formal poster session and reception with authors available for discussion.

MONDAY, 27TH AUGUST, 2012

Morning

INFECTIOLOGY SESSION

- Lesions of skeletal tuberculosis on a young woman's knee, buried in S. Giovanni Battista church in Leontica (Ticino, Switzerland). Preliminary results of the interdisciplinary project: Archaeology and Anthropology of southern Swiss alpine cemeteries from medieval times. ANDREETTA
- Possible evidence of leprosy in medieval "Gard Provençal": Burial SP 21373 from the Saint Jean de Todon cemetery in Laudun l'Ardoise (Gard, France). ARDAGNA
- Osteoarchaeological evidence of Leprosy from Medieval Sudanese Nubia. ARDAGNA
- Evidence of tuberculosis in ancient syria dating from pre and early domestication. BAKER
- 'From Cemetery to Clinic': 3D Digitised pathological data from archaeological leprosy skeletons. BUCKBERRY
- Spinal tuberculosis from the Middle Ages in Transylvania (Romania). HAJDU
- Two Possible Cases of Leprosy in Medieval Poland. JUSTUS
- Lymph Node Tuberculosis with Diffuse Periosteal Reaction in Medieval Tuscany (11th-12th Century, Pieve di Pava, Siena). MONGELLI
- Lagos leprosarium (Portugal): direct and indirect evidence of disease. NEVES
- Probable cases of skeletal tuberculosis in the osteoarchaeological series of Horvát tranzit 40 (Hungary) – case report. PAJA
- Quantifying Rhinomaxillary Syndrome using 3D Shape Analysis. PLOMP
- Foreign soldiers and syphilis in 16th century zagreb. PREMUSIC
- Leprosy and the Indus Civilization. ROBBINS SCHUG

MISCELLANEOUS

- Differential diagnosis of an unknown soft tissue calcification from an urban post-medieval burial in Vienna, Austria. BINDER
- The soft-tissue bony interface of tophaceous gouty arthritis. BUCKLEY
- The Beginning of Horseback Riding in Prehistory: Suggestions from the Human Skeletal Remains. CANCI
- Developmental Anomalies of Vertebral Column in Celtic Populations of Central Europe (Czech Republic). CERVENKOVA
- Metaphyseal porosity on perinatal individuals: physiology versus pathology. Contribution of microtomodensitometric analyzes to Saint-Gilles skeletal series (Gard, France). COLOMBO
- A case of Muller-Weiss disease in late roman empire. COUDERT
- Anatomical Patterning in Degenerative Joint Disease. CRAPS
- Sacralization of the fifth lumbar vertebra in the Nabataean tomb IGN 117 in Mada'in Salih (Saudi Arabia). DELHOPITAL
- A case of Cerebral Palsy in Saint Amé (18th century, Northern France). DEPREUX
- Archaeological evidence of the 18th century practice of anatomical dissection - Saint-Jacques cemetery (Douai, Northern France). DEVRIENDT
- A Medieval Privileged Burial from the Episcopal Complex of Padua (Italy). Palaeopathological Considerations. FARINA
- Juvenile Scurvy in two Bronze Age Caucasian Sites. FUCHS

Afternoon

PARASITOLOGY SESSION

- Dicrocoeliasis in a Bog Mummy from the Netherlands. BIANUCCI
- Tests of new extraction methods in Paleoparasitology and an attempt at quantification. DUFOUR
- Human coprolites from Guanches mummies, Canary Islands, Spain: Paleoparasitological and Paleogenetic Analysis. GUIJON BOTELLA
- Trichuridae eggs revealed from a late Roman grave (Amiens, Northern France): A preliminary report MOWLAVI

DNA SESSION

- The importance of sequencing: A case study of 'tuberculosis' amplification from 20th century skeletal remains. BOUWMAN
- Genetic lineage of Mycobacterium tuberculosis in Medieval Nubia. ZINCHENKO

MISCELLANEOUS

- A case of Klippel-Feil Syndrome in South Korea dated 2100-2000 years ago. FUJITA
- The microstructure of cribra orbitalia as seen via micro computed tomography (μ CT) in post-medieval skeletons from the Bristol Royal Infirmary. GALEA
- Generalized sclerosis and hyperostosis – a differential diagnostic challenge. KELLER
- Bioarcheological and historical analysis of mother-infant-children crypt burials in Castelsardo, Sardinia, Italy (1600-1825). KELVIN
- Pathology or Taphonomy? A skeleton from Mozan (Northeastern Syria) dates to the Middle Bronze Age (2000 – 1600 BCE). KHARABI
- A comparative study of osteoarthritis in four Swedish medieval skeletal assemblages. KJELLSTRÖM
- Ankylosing Spondylitis or Diffuse idiopathic skeletal hyperostosis in historic specimens from Mautern (Lower Austria). KLEMENT
- Paleopathological interpretation of changes occurring on the skull of the child uncovered on the settlement of the Lusitan culture (8th – 5th century BC) in Gzin (North Poland). KOSLOWSKI
- The Chieftain of Oss: New perspectives on an Iron-Age individual with DISH. LEMMERS
- A Case Of A Malign Tumour In Iron Age Switzerland. LÖSCH
- Rheumatoid Arthritis in individuals interred in an unusual Iron Age context from Leonding, Austria. MARSCHLER
- Probable metastatic carcinoma in a medieval cemetery from Hungary. MARSCIK
- Severe and diffuse periosteal reaction in a child from the Imperial Rome (1st-2nd century AD). MINOZZI
- Unusual Case Of Multiple Osteosclerotic Lesions In An Iron Age Skull From Switzerland MOGHADDAM
- A Case of Metastatic Carcinoma from 12th – 13th Century Transylvania, Romania. MUJA
- Paleopathological Studies on Joseon Dynasty Human Sample Collection in Korea. MYEUNG
- Unusual Pathology in a Human Male Mandible dating from the PPNB Period, Yiftahel, Israel. SELLA-TUNIS
- Burdens of Early Bronze Age Childhood: Two examples of bone resorption and bone formation at Hainburg-Teichtal (Lower Austria). SPANNAGL
- Forensic anthropology case study: Possible foetal alcohol syndrome? STEYN
- A rare case of sternal clefting: a discussion and differential diagnosis. VAN DER MERWE
- Atlas-Axis Fusion – A Case Study. WILTSCHKE

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TUESDAY, 28TH AUGUST, 2012

Morning

TRAUMA AND STRESS MARKERS SESSION

- Scalping in the European Mesolithic – The Skateholm case. AHLSTRÖM
- Skull surgery in the Italian Renaissance. A case of cranial trepanation from the San Francesco convent (Conegliano, northeast Italy). BECK De LOTTO
- Three Cases of War Injuries from the Medieval Town of Staraya Ryazan. BEREZINA
- Two cases of skull trepanation in Eneolithic burials from the piedmont area of Northern Caucasus. BEREZINA 2
- A dog's life. Multiple trauma and potential abuse in a medieval dog from Guimps (Charente, France). BINOIS
- 'Losing Our Heads': Osteological Evidence for Decapitation in Medieval Ireland. CARTY
- Blast trauma from a world war one mass grave. COLARD
- Vertebral Compression Fractures: Towards a Standard Scoring Methodology in Paleopathology. CURATE
- Four Skulls with Mortal Injuries from Talamanca's Cemetery, (Spain): Problems with Posterior Anthropric Manipulation FONTAINE
- Life on Shipboard: Activity-Induced Musculoskeletal Stress Markers of a Sailor from 16th Century Alghero (Sardinia, Italy). GIUFFRA
- Osteoporosis and hip fractures in Medieval Sweden. HONGSLO
- Medical Treatment or legal punishment? – Limb amputations in Medieval Austria. KANZ
- The early Bronze Age population Franzhausen I (Lower Austria): Traumata and past grave disturbances – a differential diagnostic challenge. KELLER
- Interpersonal violence or apotropaic rite? Two cases of cranial perforations from Medieval Italy. MARINATO
- The Fog of War: Visible and Invisible Injuries and Isotope Analysis of Early 19th Century War Casualties from Fränkenau, Germany. MEYER
- Musculoskeletal stress of the upper limb in a Mycenaean era population of Athens. MOUNTRAKIS
- Traumatic injuries in the Late Medieval and Early Modern population from Łekno, Poland. MYSZKA
- Busy Bones: Osteoarthritis and musculoskeletal markers as evidence of physical stress in a rural Dutch community. PALMER
- Analysis of an Iron Age trepanned skull from the Tiène des Maulins rock shelter (Belgium). POLET
- Interpersonal violence or apotropaic rite? Two cases of cranial perforations from Medieval Italy. PULCINI
- Analysis of a mediaeval skeleton with contact injuries through μ CT and histology. SCHAMALL
- Age estimation and enthesal changes: correlation between estimation bias and robusticity in lower limb entheses. VILLA

STABLE ISOTOPES SESSION

- Infant and young child feeding practices, mortality and health in Great Moravian skeletal sample (9th-10th century, Czech Republic). KAUPOVA
- Dietary patterns in the mixed lay and monastic population from the post-medieval Carmelite friary burial grounds at Aalst (Flanders, Belgium), and their relationship with DISH. QUINTELIER
- Oral diseases and palaeonutrition in two Renaissance noble families from Italy. MINOZZI

Afternoon

POPULATION, EPIDEMIOLOGY SESSION

- Pathological evidence in human remains recovered from a 19th to 20th century public cemetery at Amieira do Tejo, Portugal. ARAUJO
- Wealth, Status and Prosperity – Biological Evidence of Social Structures at an Early Medieval Burial Site? CZEMARK
- Burial, social identity and trauma at Tell Nader, Iraq. FOX
- Urbanization and activity patterns during the 17th and 19th centuries in Japan GIANNAKOPOULOU

- Evidence of Rickets in the Medici Children (Florence, 16th– 17th Centuries). GIUFFRA
- Environmental stress in the medieval West Slavic population of Cedynia (Poland). IWANEK
- Paleopathological assessment of a crypt population during the 17th century to the 19th century. KELVIN
- Periostitis of tibia in historical subadult skeletal populations from Poland. Comparative study. KOSLOWSKI
- Poorer Health in Late Roman immigrant soldiers? KRAIS
- The Galler Pathological Human Bone Collection and Database. LINK
- The ancient population of Scythians. Introduction of a research project. LUKASIK
- Victims of the Inquisition: pathology in unburied individuals from Évora, Portugal. MAGALHAES
- Malignant tumors in osteoarchaeological samples from Hungary – literature review and new cases. MOLNAR
- Living conditions, social differences and biological relations in Celtic societies in the Traisen-Valley (Lower Austria) NOVOTNY
- Normal bone growth versus abnormal new bone formation and porosities in non-adult individuals from post-medieval Jelgava, Latvia (17th – 18th c. CE). PETERSONE
- The frequencies of cribra orbitalia, humeral and femoral cribra in non-adult skeletons from a medieval cemetery of Cedynia, Poland. PIONTEK
- A Belly of Bone: Investigation of an Unusual and Rare Bone Mass Found in a Post-Medieval Individual from Chichester, UK. PONCE
- Face-down burials in the Roman world: physical, social and ideological reasons of a deviant practice. Archaeological and anthropological analysis of some examples from X regio (North-eastern Italy). ROSSI
- Killed or killers? The case study of the anthropological material from the Byzantine church crypt (Black Sea, Russia). SHVEDCHIKOVA
- Skeletal identity of past populations: unstudied European, American and African remains. STEYN
- Signs of sinusitis associated with urbanisation in Viking Age-early medieval Sweden. SUNDMAN
- Palaeopathology from the enclosed cemetery at Ballinderry, Co. Kildare. TESORIERI
- Osteoarthritis at the temporomandibular joint in prehistoric pastoral populations from Alati, Russia: prevalence and etiology. TUR
- Stone by stone: the body-stone collection of the “Pathologisch-anatomische Sammlung im Narrenturm – Naturhistorisches Museum Wien” (PASiN – NHM*). WINTER
- A bioarchaeological approach on late medieval Venice area: new results about health status and occupational activities from Campagna Lupia. ZAGO

WEDNESDAY, 29TH AUGUST, 2012

Morning

ODONTOLOGY SESSION

- Age-at-death estimation of pathological individuals. A complementary approach using teeth cementum annulations. BERTRAND
- Dental anthropology at Medieval Cencelle (Latium, Italy). BILOTTA
- TCA and Adults Survival in Past Populations. BLONDIAUX
- Age at death evaluation of urn burials (Friedenhain-Preš'ovice type) from the Late Roman and Migration Period - TCA applied to cremated teeth using automated line counting (Auto-TCA). CZEMARK
- Age at death evaluation by tooth cementum annulation (TCA) – software for an automated line counting. CZEMARK
- Means of distinction between taphonomic and pathologic processes in the case of molar-incisor hypomineralisation. GAROT
- Stature and dental enamel hypoplasia in Late Medieval urban North-West Europe. GERNAY
- Anthropological analysis of dental caries intensity in males and females from historical populations from Europe. JERSZYNSKA
- Ectopic eruption of an inferior permanent molar from the Medieval Necropolis of Alcáçova do Castelo, Mértola, Portugal. LEANDRO

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MUMMY STUDIES SESSION

- From paleoradiology to paleoimaging – comparing X-ray, computed tomography and magnetic resonance ultra-short-echo-time sequence imaging techniques in the study of ancient Egyptian mummies. CAVKA
- “Evidence-based Palaeopathology”: Meta-analysis of Pubmed®-listed scientific Studies on Pre-Columbian, South American Mummies. DAGEFORDE
- Pharaoh’s Workers: the history and bioarchaeology of occupational health in ancient Egypt. Le ROUX
- CT-based segmentation and visualization of mandibular pathology in a Korean mummy. LYNNERUP
- Terahertz imaging modalities of ancient Egyptian mummified objects. ÖHRSTRÖM
- Herniation Pits in Human Mummies: A CT Investigation in the Capuchin Catacombs of Palermo, Sicily. PANZER
- The mummies from the church of Santa Maria Della Consolazione in Sicily (South-Eastern Sicily). VENTURA
- Evidence of nail care in a modern mummy from Sermoneta (central italy). VENTURA
- The mummified bodies from the church of San Arcangelo in Sermoneta (central Italy). VENTURA
- An Extraordinary Interment Found in Early New Kingdom Luxor. WALKER

MISCELLANEOUS

- Identifying Degenerative lumbar spinal stenosis in skeletal material. ABBAS
- A case of mesomelic dysplasia in a simultaneous burial of three individuals. BOUCHEZ
- Macroscopic and radiological study of a possible case of thalassemia major in a child of a New Kingdom Theban necropolis. HERRERIN
- A Case of Foot Polydactyly in a Preroman-Celtic Skeleton from the City of Verona (Italy). LAFFRANCHI
- The skeleton of a female dwarf dated to 19th century from Wroclaw, Poland. NOWAKOWSKI
- A child with Down’s Syndrome from Saint-Jean-des Vignes France dating to Early Middle Ages. RIVOLLAT
- Limb Bone Morphology in an Archaeological Case of Achondroplastic Dwarfism. SAERS

Authors are kindly asked to put up their posters on the half-day where the specific poster session is scheduled as soon as possible in order to enable the conference participants to view their posters at any time within the display half-day, and to take them down at the end of the last oral session.

Lille, France

August 27 - 29, 2012

The 19th european meeting of the paleopathology association

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ABSTRACTS

The 19th european meeting of the paleopathology association

Abbas J.^{1,2}, Hamoud K.³, Peleg S.², Medlej B.¹, Stein D.¹, Hershkovitz I.¹ and Peled N.⁴

¹Department of Anatomy and Anthropology, Sackler Faculty of Medicine Tel-Aviv University, Israel.

²Department of Physical Therapy, Zefat Academic College, Zefat, Israel.

³Spine Unit, Poria Medical Center, Tiberias, Israel.

⁴Department of Radiology, Carmel Medical Center, Haifa 34362, Israel.

Podium

Identifying Degenerative lumbar spinal stenosis in skeletal material

Keywords: *Degenerative lumbar spinal stenosis, vertebral body and canal dimensions, Schmorl's nodes, paleopathology.*

Back ground: Lumbar spinal stenosis (LSS) and vertebral lesions such as Schmorl's nodes are common pathological conditions observed in archaeological skeletal remains. LSS is a clinical condition that can be either congenital (developmental) or acquired. Acquired degenerative LSS is considered to be the more common type and it usually arises at an advanced age. It is essentially associated with degenerative changes of the three-joint complex, ligamentum flavum thickening and osteophyte formation. Many studies agree that degenerative LSS is related to spinal canal size, however, data regarding degenerative LSS and bony vertebral configuration and lesions are rare.

Objective: To identify in living individuals any correlation between bony vertebral configuration and lesions (e.g. Schmorl's nodes) and degenerative LSS, in order to furnish paleopathologists with a reliable tool for identifying this phenomenon in skeletal populations.

Methods: Two groups of living populations were utilized. The first group included 165 individuals with clinical symptoms of degenerative LSS (mean age 64.3 ± 9.9) and the second, 180 individuals (mean age 62.5 ± 12.6) without LSS related symptoms. All measurements and observation were carried out on CT images (Philips Brilliance 64), and included: anterior posterior (AP) bony canal diameter, transverse bony canal diameter, pedicle width, vertebral body width and length and the presence of Schmorl's nodes. Measurements and observation were performed at the levels of L1-L5.

Results: AP bony canal diameters (but not transverse diameter) were significantly smaller in the stenosis group compared to the control group. In the stenosis group, the pedicle widths were significantly higher compared to the control. Vertebral body widths and lengths were significantly greater in the stenosis

group compared to control. The relative frequency of Schmorl's nodes was considerably higher in the stenosis group compared to the control.

Conclusions: Paleopathologists can use a battery of measurements and observations in order to reliably identify degenerative LSS.

Acknowledgments: We thank the Dan David foundation, the Tassia and Dr. Joseph Meychan Chair of History and Philosophy of Medicine, the Israel Science Foundation (ISF: 1397/08) and the Fingerhot Karol and Lionora foundation for their financial support.

Abramov J.¹, Peled N.², Slon V.¹, Tatiana Sella-Tunis T.¹, Feldman M.¹ and Hershkovitz I.¹

¹Department of Anatomy and Anthropology, Sackler Faculty of Medicine, Tel-Aviv University, Ramat-Aviv, Israel.

²Department of Radiology, Carmel Medical Center, Haifa, Israel.

Podium

Computer Tomography-based Differential Diagnosis: It is not what it looks like

Keywords: *pathology, Computed tomography, Syphilitic periostitis, Bone fracture.*

It is well known that bones react similarly to different diseases, hindering precise diagnosis. Macro changes in bone structure and shape are considered relatively simple to diagnose. Nevertheless, the picture is never straightforward and each case needs to be thoroughly examined.

A pathological fragment of a right femur was discovered in the Byzantine layer (638-324 CE) of the site of Caesarea, Israel, during the 1993 excavation season. Unfortunately, as the rest of the skeleton was not preserved, the age and sex of the individual could not be determined. The bone fragment displays an abnormal bone deposition alongside its length, on its posterior aspect, from the femoral neck to the mid-shaft, causing the width of the femur to be twice its normal size.

A computed tomography (CT) examination was performed by a Philips iCT 256 scanner at the Carmel Medical Center in Haifa, Israel, and reviewed using a Brilliance Workspace Portal (Philips Medical Systems, Cleveland, Ohio). Cross-sections and 3-D reconstructions were used in order to examine this unusual pathology.

Differential diagnosis includes: a badly reformed fracture, a bone tumor, syphilitic periostitis and chronic infection.

Although based solely on one bone fragment, the

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diagnoses proposed in this case may reflect on the medical abilities of the population of Caesarea during this period, as well as on the pathophysiology of the diseases when modern medicine practices are not available.

Acknowledgments: We thank the Dan David Foundation and the Tassia and Dr. Joseph Meychan Chair for the History and Philosophy of Medicine for their financial support.

Ahlström T.

Institute of Archaeology and Ancient History, Lund University,
Box 117, 221 00 Lund, Sweden.

Poster

Scalping in the European Mesolithic – The Skateholm case

Keywords: *Mesolithic, Skateholm I, Sweden, Scalping, Virtual reality (VR).*

There is a hierarchy with respect to the nature of cuts one person may deliver to another person, the unkindest being not necessarily the mortal one, but rather, the one that leaves the victim alive but stigmatized for the remainder of life. The act of scalping, i.e. the intentional removal of the scalp, is certainly one of the unkindest cuts. Grave 33 of the late Mesolithic cemetery at Skateholm I, Southern Sweden, represents an unusual context as it is the only grave with a prone individual buried at the site. Further, the cranial vault displays several traumatic and inflammatory vestiges that have been interpreted as indicative of a healed scalping. In this paper, I present the archaeological context and paleopathological findings. A 3D scanning of the calotte is used for the visualization of the pathological changes.

Anastasiou E. and Mitchell P.D.

Department of Archaeology and Anthropology, University of Cambridge, The Henry Wellcome Building, Fitzwilliam Street, Cambridge CB2 1QH, UK.

Podium

Simplifying the process for extracting parasitic worm eggs from cesspool sediments: a trial comparing the efficacy of widely used techniques for disaggregation

Keywords: *methodology, parasites, roundworm, technique, trial.*

In paleoparasitology, the extraction of the eggs of parasite species from latrine sediments or coprolites before they can be viewed under the microscope is the

cornerstone of the field's methodology. Since 1960, rehydration/disaggregation in a 0.5% aqueous solution of trisodium phosphate (TSP) for 72 hours has become a standard processing step. This separates out clumps of soil particles and any eggs that may be adherent to them. However, to our knowledge no one has published an evaluation as to whether rehydration and disaggregation with TSP is actually necessary when latrine sediment samples are analysed, or whether the time period of disaggregation affects the outcome of the analysis. Similarly, the efficacy of the widely used step of sonication in an ultrasound bath in improving the disaggregation of the samples has not been proven in a systematic manner in a publication.

Here we present a study designed to investigate whether the disaggregation medium, the length of time, and sonication have any effect on the number of parasite eggs extracted from latrine sediments. Soil samples from a cesspool from Israel and a latrine from Cyprus that both contain eggs of *Ascaris lumbricoides* (roundworm) were analysed with different techniques for disaggregation. The results demonstrate there was no significant difference for either sample in the number of eggs per gram of soil obtained when using distilled water instead of TSP, when disaggregating for 72, 24 or 1 hour, or when using sonication as an additional step. This study shows that when latrine sediments are analysed, rehydration with water for one hour alone prior to sieving and microscopy is equally effective as rehydration with a 0.5% aqueous solution of trisodium phosphate for 72 hours followed by sonication. This simplification of the technique saves considerable time and the expense of extra chemicals and equipment.

To be considered for the Cockburn Student Prize.

Andretta A.^{1,2} and Lösch S.³

¹Institute of Archaeology, University of Bern, Switzerland.

²Archaeological Service Tessin, Switzerland.

³Department of Physical Anthropology, Institute of Forensic Medicine, University of Bern, Switzerland.

Poster

Lesions of skeletal tuberculosis on a young woman's knee, buried in S. Giovanni Battista church in Leontica (Ticino, Switzerland)

Keywords: *interdisciplinary project, medieval times, southern Swiss alps, skeletal tuberculosis, knee joint.*

The project comprises three main aspects: archaeology (based on the funerary architecture and the organization of the ensemble, their spatial distribution and topography), physical anthropology (usual determinations and palaeopathological investigations)

and stable isotope analyses (C, N, O, S to address questions of the natural environment, as well as diet, mobility but also C-14 for the chronology). The examined population originates from different places in today's cantons Ticino, and Misox Valley in canton Grisons - both regions south of the Swiss Alps. The remains date to the 6th-12th century AD, the graves contained no grave goods.

Up to now, 350 individuals from 18 church or church-associated cemeteries were investigated. The anthropological examination includes the determination of sex, the age at death, and a palaeopathological investigation. Radiological analyses are carried out at interesting palaeopathological cases.

The reported individual was buried in the church of Leontica (Cardani Vergani, 2001). It dates most likely to the 11th or 12th century AD. The skeletal remains belong to a young woman of 20-25 years of age. The individual has an obvious pathology in the lower limbs, particularly in the right knee joint. The joint adhered in an unnatural position and shows discharging bacterial reactions.

The radiological investigation excludes the possibility of any fracture, so the lesions must be the result of skeletal tuberculosis. Tuberculosis of the knee is quite common, making 16% of all recent cases (following 43% in the spine and 20% in the hip - Aufderheide & Rodriguez-Martin, 1998).

However, bacteriological analyses are the only formal evidence to confirm a tuberculosis infection, so future histological and mycobacterial DNA analyses are planned.

Today, there are still no physical anthropology or palaeopathology records in the canton Ticino whatsoever. This lesion is also the first case of a skeletal knee joint tuberculosis in Switzerland.

Applicant Cockburn Student Award.

Bibliography:

Aufderheide A. Rodriguez-Martin C. (1998) Human Paleopathology

Cardani Vergani R. (2001) Leontica Ti, chiesa parrocchiale di San Giovanni Battista, Jahresbuch SGU 84.

Araújo A.¹ and Santos A.L.^{1,2}

¹Department of Life Sciences, University of Coimbra, Portugal.

²CIAS – Research Centre for Anthropology and Health, University of Coimbra, Portugal.

Poster

Pathological evidence in human remains recovered from a 19th to 20th century public cemetery at Amieira do Tejo, Portugal

Keywords: *Paleopathology, differential diagnosis, bone remodeling, osteolytic lesion, adults.*

The pathological cases presented in this work are from two archaeological excavations carried out inside the Castle of Amieira do Tejo, which was adapted in 1839 to a public cemetery in use until the 1940s. The sample consists of a minimum number of 59 individuals, of which 18 were adult skeletons (10 males, 4 females, 4 indeterminate) and 8 non-adults.

This paper aims to present three selected cases of pathology, exclusively through macroscopic observation. The first case is a mature adult male with osteolytic lesions and new bone formation on the long bones of the right upper limb and the left lower limb. The second refers to a mature adult male with new bone formation in the long bones of the upper and lower limbs and on fragments of the ribs. Among the commingled bones from the same layer were observed osteolytic destruction and new bone formation in the right radius and ulna of an adult female, and in several hand bones. Due to the similarity of the lesions in all these bones it is hypothesized that they all belong to the same individual.

The cases reported are discussed through the differential diagnosis and compared with existing literature. Although these are the first results from the study of the entire sample, they intend to contribute to the knowledge of paleopathology in the 19th to 20th centuries in a rural area of the country.

Arcini C.

National Heritage Board Contract Archaeology Service, Odlarevägen 5 226 60 Lund, Sweden.

Podium

In the wake of the Black Death - increased well-being for the survivors?

Keywords: *Black Death, Medieval, stature, Sweden.*

Historical sources indicate that population size changes through history like waves. Looking back, a peak of one such wave was seen in the middle of the 14th century. In Europe as well as in Sweden the increase in population size 1050-1350 resulted in agricultural expansion and the necessity of new cultivation in areas where the productivity was lower and some populations were forced to live on the margins. Then in 1350 the devastating Black Death reached Sweden and the population decreased dramatically. However, based

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on the written record it has been suggested that labour shortages resulted in lower taxes and higher salaries which in turn resulted in improved living conditions for the lower classes. In the project “The archaeology and ecology of collapse: social and agricultural change following the Black Death in Sweden” one aim is to test the hypothesis of improved living conditions. One health measure that may capture the direction and strength of social change is stature. Within the project, variation in stature is studied based on c.2000 human skeletons from medieval churchyards in present day Sweden.

Ardagna Y.¹, Bouchez I.¹, Maillot M.², Evina M.³ and Baud M.⁴

¹Laboratoire UMR 7268 - ADÉS - Anthropologie bio-culturelle, Droit Ethique et Santé, Aix-Marseille Méditerranée, Faculté de Médecine. Secteur Nord, Batiment A - CS80011 Bd Pierre Dramard 13344 Marseille Cedex 15 France.

²Université Paris-Sorbonne, rue Victor Cousin, 75005 Paris, France.

³Laboratoire HeRMA, Université de Poitiers, 8, rue René Descartes, 86022 Poitiers cedex, France.

⁴Département des Antiquités égyptiennes, Musée du Louvre, Porte des Arts, 75058 Paris Cedex 01, France.

Poster

Osteoarchaeological evidence of Leprosy from Medieval Sudanese Nubia

Keywords: *Leprosy, Middle-Age, Sudan.*

The site of Mouweis (Shendi area, about 250 km north of Khartoum) is a recently discovered Nilotic city of the Meroitic period (3rd century BC to 4th century AD) excavated by the Louvre Museum since 2007. This large settlement includes a 1st century AD palace, later destroyed and reduced to a hill-shaped ruin. During the medieval period, a cemetery of about 40 graves was dug in the demolition level of this palace. Bone samples from two skeletons from this cemetery returned a radiocarbon date range of 13th – 14th century AD. Recent macroscopic examination of the skeletal remains has revealed palaeopathologic features suggestive of facies leprosa on one individual from grave 13. The cranium of this 40-50 year old woman showed significant bone resorption and atrophy, particularly in the nasal area. Associated with these pathologies are several changes to the hands: periosteal reactions, enlarged nutrient foramina and phalangeal osteolysis. Periosteal reactions are also noticed on both tibias, as well as concentric atrophy of phalanges or enlarged nutrient foramina on both feet. Thus, the individual from grave 13 of Mouweis displays classic signs of leprosy, providing new evidence for the disease

in Sudanese Nubia.

Ardagna Y.¹, Bouchez I.¹ and Vidal L.^{1,2}

¹Laboratoire UMR 7268 - ADÉS - Anthropologie bio-culturelle, Droit Ethique et Santé, Aix-Marseille Méditerranée, Faculté de Médecine. Secteur Nord, Batiment A - CS80011 Bd Pierre Dramard 13344 Marseille Cedex 15 France.

²INRAP Méditerranée, Base de Nîmes, 561, Rue Etienne Lenoir, 30900 Nîmes France.

Poster

Possible evidence of leprosy in medieval “Gard Provençal”: Burial SP 21373 from the Saint Jean de Todon cemetery in Laudun l’Ardoise (Gard, France)

Keywords: *Leprosy, Middle-Age, Provence, Burial Treatment.*

A medieval cemetery associated with the Saint Jean de Todon Chapel has been under excavation since 2002 in Laudun l’Ardoise (Gard, France). This fairly well preserved site is located on a plateau overlooking the Rhône corridor. Radiocarbon dating and pottery analysis reveal the main periods of burial activity to be the second half of the 9th century - early 11th century and the early 11th century to mid - 12th century. The complete archaeological survey of the chapel and the overall osteological study are still in progress. To date, 163 stone cist graves have been excavated and the remains of 203 individuals recovered (mostly elderly adults). This observation, the funerary architecture and the cist ornamentation such as the stela, stone bed, and lime or mortar layer, indicates that the buried individuals were probably ranked among the higher echelons of society. However, the skeleton of burial SP21373 (a woman of about 50 years old) exhibits slight signs indicative of probable leprosy. The facial area of the cranium of SP 21373 shows changes (apertura piriformis enlargement and destruction of the nasal anterior spine). Furthermore, the oral aspect of the bony palate displays an inflammatory process and there is some bone loss in part of the posterior palate. Those lesions are compatible with a rhino-maxillary syndrome of leprosy. The early stage of development of appendicular lytic lesions is also observed.

Finally, this skeleton was not segregated, but buried in the eastern part of the cemetery in the same kind of stone cist grave as the other individuals.

Baker O.¹, Lee O. Y.-C.², Minnikin D. E. ², Chamel B.³, Khawam R.³, Coqueugniot E.³, Helmer D.³, Gourichon L.⁴, Le Mort F.³, Colombo A.⁵, Dutailly B.⁵, Coqueugniot H.⁵, Dutour O.⁶

¹EPHE – Laboratoire de Paléanthropologie – UMR 5199 PACEA (CNRS- Université de Bordeaux I), avenue des facultés, 33405 Talence cedex, FRANCE.

²School of Biosciences, University of Birmingham, Birmingham, UK

³UMR 5133 Archéorient : environnements et sociétés de l'Orient ancien, Maison de l'Orient et de la Méditerranée – Jean Pouilloux, 7 rue Raulin, 69365 Lyon cedex 07 FRANCE.

⁴CEPAM (UMR 7264) - CNRS Université Nice Sophia Antipolis - Campus Saint-Jean-d'Angély (SJA3) - 24 avenue des Diabes Bleus - 06357 Nice Cedex 4 FRANCE.

⁵UMR 5199 PACEA (CNRS- Université de Bordeaux I), avenue des facultés, 33405 Talence cedex, FRANCE.

⁶EPHE – Laboratoire de Paléanthropologie – UMR 5199 PACEA (CNRS- Université de Bordeaux I), avenue des facultés, 33405 Talence cedex, FRANCE. Department of Anthropology, University of Toronto, 19 Russel Street Toronto, CANADA.

Poster

Evidence of tuberculosis in ancient syria dating from pre and early domestication.

Introduction:

The question of pre-neolithic tuberculosis is still open in paleopathological perspective. One of the major interest is to explore what type of infection could have existed prior to the domestication and at its early stages.

Objective:

Description of paleopathological lesions observed on skeletons coming from two PPNB sites representing pre and early domestication phases in Syria, belonging to the geographical cradle of agriculture.

Materiel and methods

Paleopathological study of two neolithic individuals from Syria : 1) adult skeleton dating from the second half of the 11th millenium BP calibrated (Early PPNB) of the predomestication neolithic site of Dja'de El-Mugara (Northern Syria), 2) immature skeleton coming from the site Tell Aswad (Southern Syria) dating from 9800-8600 BP calibrated (Middle PPNB).

Laser scanning and microCT scan have been applied. Detection of mycolic acids is in progress; aDNA analyses are planned.

Results

Dja'de adult skeleton exhibits lesions that are typical of an infectious spondylodiscitis: the inferior part of the 9th thoracic vertebrae is completely destroyed, the upper plate of the 10th thoracic vertebrae shows lytic rounded cavitations expanding to the vertebral body.

Tell Aswad immature individual exhibits plurilamelar periosteal reactions of all the long bones,

associated with spina ventosa of the right ulna.

Conclusion

This two paleopathological cases strongly suggest the presence of tuberculous infection before domestication as well as in its early stages. Molecular analyses are in progress in order to better explore the past history of human tuberculosis.

Baxarias J., Fontaine V., Garcia-Guixé E., Nuñez M., Herrerin J. and Dinares R.

Museu d'Arqueologia de Catalunya, Barcelona, Spain.

Podium

Early and late anthropic intentional traces in Egyptian dynastic mummies

Keywords: *Thebes tombs, mummification, entropic, paleopathology, Egypt.*

The Egyptian funerary ritual is in fact a complex anthropic act, based on a magical religious performance on the corpse immediately post-mortem. This Egyptian magical funerary rite shows a large variability according to the geographic area, the period or the priests' school. Especially interesting is the action on human remains presenting signs of manipulations made by later generations, whose ritual background has been maintained more or less modified.

We studied some 90 mummies proceeding from the western necropolis of Luxor, in front of Deir-el Bhari temple, in an area delimited by the Metropolitan House, the TT-28 and TT-188 tombs to the west, and TT-408 and TT-409 to the northeast. We found human remains from tombs and shafts of three different periods: the Ptolemaic era, the new Empire, and the third intermediate period. For these remains, we analysed all the anthropic actions identified with the mummification ritual and also those that occurred a very long time after the mummification process to evaluate the variability through time. Most of these actions are not described either in the classical sources nor in papyrus texts. How the human remains were treated in later periods after they had been robbed/stolen, or after the destruction of the tomb, is an important part of the Egyptian funerary ritual not described until now. Only the study of the human remains can explain it to us.

Beck De Lotto M.A., Zago M. and Canci A.

Dipartimento dei Beni Culturali: Archeologia, Storia dell'Arte, del Cinema e della Musica - Università degli Studi di Padova.

Poster

Skull surgery in the Italian Renaissance. A case

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of cranial trepanation from the San Francesco convent (Conegliano, northeast Italy)

Keywords: *cranial trepanation, Italian Renaissance, Hippocratic drill.*

Cranial trepanation is one of the oldest surgical techniques, used by past populations in many regions of the world. This practice is based on different techniques and was used for some kind of magic-ritual treatment or with surgical intent to cure cerebral disturbances or remove bone fragments after cranial injury.

Hippocrates (460-377 BC) describes one such technique in *Corpus*, his compendium about medical traditions. It consists in the use of a peculiar hollow trephine, called a *prion*, which was a cylinder equipped with a metal crown gear at one end. The use of the instrument in Roman times is attested by the discovery of crowns in burials and by the text of Celsus. From the 17th century onward, trephines were also in use with the crown fixed to a simple T-shaped handle; the crown became more conical and the opening smaller so as to keep the osseous disc from slipping into the cerebral cavity.

A case of cranial trepanation by Hippocratic drill was found in the excavations at the former convent of San Francesco in Conegliano, a town near Treviso, dated between the XIV and XVIII century AD. The excavation recovered skeletal remains belonging to 185 individuals: 41% male, 26% female, 9% of indeterminate sex and 24% juvenile.

Among these, a *calvaria* of a young adult female probably dating to the Renaissance was found in a collective tomb. The cranial vault shows a circular perforation in the bregmatic area of the left parietal bone measuring 17mm in diameter. The skull does not display any pathological changes that may have justified the trepanation, and the absence of reparative processes on the edges of the perforation indicates that the woman died during or shortly after surgery.

Bennike P.

Saxo Institute, University of Copenhagen, Denmark.

Podium

Women to the left, please! Human skeletal remains from the late Mesolithic site of Nivå 10 in easterne Denmark

The anthropological studies of the human skeletal remains from the excavation at Nivå 10, Denmark confirm the previously known pattern and variation of the Mesolithic population in Scania in relation to demography, pathology, trauma, dentition and

anthropometry. However, a skeleton of a young man had serious pathological changes of the left femur probably after a fracture. Furthermore three out of nine graves with human skeletal remains were double graves. Even though numbers are small, it is a rather high frequency of double graves compared to other Danish and Swedish sites. Mesolithic and Palaeolithic graves with more than one person are known from a number of geographical localities but in a relatively small number. The most intriguing question, in connection with multiple burials, is whether the individuals died at the same time and perhaps show similar cause of death such as disease or trauma. It is almost impossible to prove and speculations have been raised whether multiple burials have root in some religious rituals or socioeconomic status deeming one or more individuals (family members?) to be buried together with the dead to follow him/her to another life. Several parallels with a similar sex distribution have been found and will be compared.

Berezki Z.¹, Molnár E.¹, Paja L.^{1,2}, Marcsik A.¹ and Pálfi G.¹

¹Department of Biological Anthropology, Faculty of Science and Informatics, University of Szeged, Szeged, Hungary.

²National Heritage Protection Centre, Hungarian National Museum, Szeged, Hungary.

Podium

Cranial surgery of the Avar Age (7-9th century AD) in the Great Hungarian Plain

Though evidence of cranial surgery is relatively rare in the bioarcheological material, a lot of skulls showing signs of surgical interventions had been found in the today area of Hungary. The international scientific audience knows very little about the diverse spectrum of cranial interventions found in Hungary since only very little information has been made accessible for non-Hungarian scholars so far. Most of these cases were attributed to early Hungarians, and actual Avar Age (7-9th century AD) findings were underrepresented within this otherwise abundant and internationally significant amount of cases.

The aim of this study is to introduce the Avar Age material collected in the Great Hungarian Plain, now housed in the collection of the Department of Biological Anthropology, University of Szeged, Hungary. The Avar material in the collection exceeds 8000 individuals. A total of 24 cranial surgery cases were found, divided into 3 categories: 10 surgical trephinations (opening of the cranial vault), 12 symbolic trephinations (superficial marking of the vault) and 2 cultical trephinations (opening of the cranial vault of the deceased).

Within this series we also introduce several new unpublished cases that increase the Avar representation in the cranial surgery records of our country. These findings may alter the assumption we formerly had of the cranial surgery of the Avars, the application of cranial surgery in childhood and the possible connection to other pathological phenomena, and also the general picture of the medical history of the Carpathian Basin.

The support of the Hungarian Scientific Research Found, OTKA NN 78555 and 78696 is greatly acknowledged.

Berezina N.¹ and Gresky J.²

¹MSU Scientific Research Institute and Museum of Anthropology, Moscow, Russia.

²Deutsches Archäologisches Institut, Berlin, Germany.

Poster

Two cases of skull trepanation in Eneolithic burials from the piedmont area of Northern Caucasus

Two sites have been excavated in the piedmont area of Northern Caucasus by the archaeological expedition of State Unitary Enterprise Nasledie in 2010: Progress-2 (Berezin S.Ya.) and Vonjuchka-1 (Kalmykov A.A.). They belong to the type of burials in small mounds, covered with huge amounts of ochre. Among others, there were four burials dating to the Eneolithic period. Radiocarbon dates of these burials confirm they date to the second half of the 5th millennium.

Two of four skeletons demonstrate extensive injury. During investigation, standard programs of sex and age estimation were used, like as morphological criteria, microphotography (Dino-Lite digital microscope) and microfocusing X-ray methods in differential diagnosis of the injuries.

The first case - a female individual (Vonjuchka-1, Kurgan 1, Grave 8) who died at the age of roughly 25 to 40 showed trepanation involving both parietal bones. The hole is situated directly above the sagittal sinus. The relatively vertically orientated margins are covered only by small islands of newly built bone showing a relatively short period of healing after the operation.

A number of cut marks were present around the trepanation that probably indicate elevating the scalp during surgical activity. We have been able to determine the primary and the final points of the operation as well.

Another case is a male individual (Progress 2, Kurgan 4, Grave 12) who died at the age of roughly

52 to 30. There were 2 oval holes on his skull. The posterior hole was situated directly above the sagittal sinus. The funnel-shaped margins were covered by a layer of newly formed bone showing that healing took place following the surgery. The second hole was located on the frontal part of the right parietal bone. X-ray of these bones suggest that this man live for some time after the operation..

Berezina N. and Rasskazova A.

Research Institute and Museum of Anthropology Moscow State University.

Poster

Three Cases of War Injuries from the Medieval Town of Staraya Ryazan

Keywords: war injuries, Middle Ages, urban population, Staraya Ryazan.

Anthropological material was excavated from the Medieval Russian town of Staraya Ryazan by the expedition of the Institute of Archeology of RAS in 2004-2005. 45 individuals were investigated (34 adults and 11 children). Three adults demonstrated different kind of injuries in skull and hip-bones. The wounds are mostly perforated and have different forms without any signs of regenerative process.

Case 1. Man, Adultus. Postcranial part of skeleton was preserved including the hip-bones, sacrum, and vertebrae. Ten perforations were detected. Eight of them are on the hip-bones and 2 are on the sacrum. Two perforations on the right upper hip bone are of square form. Left upper hip bone has 5 perforations: 4 square holes and another square hole on the entrance side and round on the exit side. We also discover small perforation on the inner side of the left ischium. On the sacrum of this individual there are 2 rhombic perforations.

Case 2. Man, Adultus. The skull, hip-bones, sacrum, and lumbar vertebrae were preserved. Six perforations were noted on the wings of the upper hip bone. The wounds all have a square form.

Case 3. Woman, Senilis. Parts of the skull, the right side of the postcranial skeleton, and fragments of lumbar vertebrae were preserved. On left side of the skull there are 3 different kinds of perforations. One of them, near bregma, has a square form on the interior surface and has round on the exterior surface.

In conclusion we examined some samples of weapons, which were discovered in the settlement. The spear and arrow heads' diameters matched the perforations' diameters. We can conclude that the

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examined *perimortem* traumas are the result of multiple combat injuries.

Bertrand B.¹, Colard T.², Naji S.³, Polet C.⁴

¹Laboratoire d'Anthropologie, Communauté d'Agglomération du Douaisis, Direction de l'Archéologie Préventive.

²Laboratoire Anthropologie Biologique, Université Lille Nord de France.

³UMR 5199 PACEA, Université de Bordeaux I.

⁴Laboratoire d'Anthropologie, Institut royal des Sciences naturelles de Belgique.

Poster

Age-at-death estimation of pathological individuals. A complementary approach using teeth cementum annulations.

Estimating individual age-at-death is a crucial yet still intricate step in paleopathology studies. Methods for adult age determination are mainly based on bone remodeling, maturation indicators or degenerative processes. Even though the biological variability of the indicators for each method is recognized, it is necessary to question the reliability of an approach based on morphological modifications when the individual is affected by bone growth pathologies.

Our study looks at several individuals exhibiting achondroplasia, osteomalacia and osteogenesis imperfecta, using the cementum annulations technique for estimating their individual age-at-death. This dental method is a complementary approach useful to validate/ invalidate an estimated individual age based on other bone indicators without the traditional biases. Teeth are often better preserved than bones archaeologically and acellular cementum observed in the median part of the root is rarely affected by pathological or degenerative processes.

The observation of cementum annulations is therefore a particularly suitable tool for the required scientific carefulness necessary to individual age estimation in paleopathology/anthropology studies.

Bianucci R.^{1,2,3}, Benedictow O.J.⁴, Fornaciari G.¹ and Giuffra V.¹

¹Division of Paleopathology, History of Medicine and Bioethics, Department of Oncology, Transplants and Advanced Technologies in Medicine, University of Pisa, Italy.

²Laboratory of Criminalistic Sciences, Department of Anatomy, Pharmacology and Legal Medicine, University of Turin, Italy.

³Laboratory of Bio-cultural Anthropology, Rights, Ethics & Health (Adés), Faculty of Medicine of Marseilles, France.

⁴University of Oslo, Oslo, Norway.

Podium

Quinto Tiberio Angelerio (1532-1617): New Rules and Control of Plague Epidemics in 16th Century Alghero (Sardinia)

Keywords: *pestis, Sardinia, 16th century Sardinian medicine, sanitary measures, plague trenches.*

Plague is a zoonotic disease caused by the bacterium *Y. pestis* which was responsible for at least three pandemics. In 1582- 1583 a plague outbreak devastated the seaport of Alghero in Sardinia. Through the analysis of the contemporary medical texts and local documentary sources, we uncovered the pivotal role played by the Protomedicus of Alghero Quinto Tiberio Angelerio (1532-1617) in the combat of the epidemic.

Angelerio imposed rules and anti- epidemic measures new to 16th century Sardinian sanitary system. A general public health framework including laws for plague control, decrees, institutions and infrastructures was created. A system of basic welfare guaranteed by the city government was also established in order to satisfy the population needs in terms of medical treatment, food supplies and to implement disinfection of the houses. Strict control of the movements of people and goods, to and from the city, was established during the epidemics.

The town was divided in 10 wards. Each ward was controlled by a Health Deputy, who was invested with full authority according to the new anti-epidemic health laws, and a Plague Guard.

Angelerio's health policy emphasized disease prevention through the isolation of suspected or infected patients. Those suspected to have plague were isolated at a centre called tancat whereas plague patients were housed at a lazaretto. Guards ensured their isolation.

Moreover, Angelerio introduced a new method for the "sterilization" of clothes, textiles and objects according to the miasmatic- contagionistic notions. Stoves/ovens similar to those used to cool the flat tiles were kept constantly lighted by an underlying fire.

Those measures undoubtedly spared the surrounding districts from the spread of the contagion. Thus Angelerio seems to have been the first successful public health officer in the history of plague epidemics in Sardinia.

Bianucci R.^{1,2}, Searcey N.³, Egarter-Vig¹, Maixner F.⁵, Piombino-Mascalì D.⁵, Zink A.⁵, Van Der Sanden W.⁶ and Reinhard K.J.⁷

¹Laboratory of Criminalistic Sciences, Department of Anatomy, Pharmacology and Legal Medicine, University of Turin, Corso Galileo Galilei 22, 10126 Turin, Italy.

²NMHEMC Research Foundation Albuquerque NM 87122 USA.

³Department of Biological Sciences, 348 Manter Hall, University of Nebraska- Lincoln, USA.

⁴Division of Pathology, General Regional Hospital, Bolzano, Italy.

⁵Institute for Mummies and the Iceman, Viale Druso 1, 39100 Bozen, Italy.

⁶Province of Drenthe, Westerbrink 1, 9405 BJ, Assen, The Netherlands.

⁷School of Natural Resources, Hardin Hall 719, University of Nebraska- Lincoln, Lincoln NE, USA.

Poster

Dicrocoeliasis in a Bog Mummy from the Netherlands

Keywords: *Dicrocoeliasis, bog body, histology, coprolite analysis, The Netherlands.*

On December 5th, 1951, two peat-cutters found the mummified body of a woman in a bog. The location was known as the 'Damsel's Bog', northwest of the villages of Aalden and Zweeloo (Province of Drenthe, The Netherlands). She was named the Zweeloo Woman after the municipality in which she was found.

The Zweeloo Woman was an adult between 35-50 years of age, as assessed by the examination of bones and teeth. Radiocarbon dating performed on both skeletal and skin tissue suggested that Zweeloo Woman was interred between the late 1st and early 3rd century AD (1861 ± 35 BP).

Zweeloo Woman's intestines and organs were preserved by anaerobic conditions in combination with natural tannic acid in the bog. The intestines were washed and examined by light microscopy for parasite eggs and dietary/medicinal remains. Coprolite analysis was also done with the same goals. Finally, liver and kidney tissues were examined to assess parasitism.

The lancet fluke, *D. dendriticum*, usually infects ruminants such as cattle. Eggs of *D. dendriticum* may be found in human coprolites if infected cow liver, for example, was eaten. This would be a case of false parasitism. Since eggs of *D. dendriticum* were found in the liver of Zweeloo Woman, we are assured this was a true infection. This finding is especially significant because it is the oldest known, patient infection of *D. dendriticum* in humans.

Bilotta C.¹, Romana Stasolla F.², Tafuri M.A.^{1,3} and Manzi G.¹

¹Dipartimento di Biologia Ambientale, Università di Roma, La Sapienza – Piazzale Aldo Moro, 5 00185 Roma, Italy.

²Dipartimento di Scienze dell'Antichità, Università di Roma, La Sapienza – Piazzale Aldo Moro, 5 00185 Roma, Italy.

³McDonald Institute for Archaeological Research, University of Cambridge, Downing Street – Cambridge, CB2 3ER, UK.

Poster

Dental anthropology at Medieval Cencelle (Latium, Italy)

In this study we have analysed 686 teeth (343 maxillary and 343 mandibular) from the skeletal series excavated at the Medieval town of Cencelle (Latium, Italy - IX-XI century AD). We applied traditional methods of dental anthropology for the recording of dental measurements, wear, and oral pathologies. Our results suggest a population characterised by reduced dental size, particularly for females, even when compared with other coeval Medieval sites of the Peninsula. Dental pathologies point at a progressive decline of oral health and general life conditions, with possible consequences in the expression of the gene pool. Our data also demonstrate a strong increase in the consumption carbohydrates with limited contribution of animal proteins.

One interesting find is the presence of strong extramasticatory wear on the lingual surface of the upper incisors. This is recorded on a fairly high number of individuals and seems to suggest the use of teeth for the processing of (vegetal?) fibres. The relatively high incidence of this trait and its particularly severe degree of expression finds no comparisons in other Italian coeval series; this calls for a more detailed analysis of work-related activities within Medieval populations.

Binder M.¹, Berner M.², Krause H.³, Kucera M.⁴ and Patzak B.⁵

¹Department of Archaeology, Durham University, UK.

²Anthropologische Abteilung, Naturhistorisches Museum Wien, Austria.

³Stadtarchäologie Wien, Austria.

⁴Ludwig-Boltzmann Institute for Archaeological Prospection and Virtual Archaeology, Vienna, Austria.

⁵Pathologisch-Anatomische Sammlung im Narrenturm, Naturhistorisches Museum Wien, Austria.

Poster

Differential diagnosis of an unknown soft tissue calcification from an urban post-medieval burial in Vienna, Austria

Keywords: *post-medieval period, Vienna, calcified tissue, goitre, thyroid.*

Calcifications are associated with a wide range of pathological conditions but are not commonly discussed in palaeopathological literature. In this paper, we present the case of a spheroid-shaped calcified object

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(5x3cms) found associated with a middle-aged male individual from the post-medieval cemetery at St.-Bartholomäus-Platz, Vienna. Unfortunately, the object was not recognized during excavation, therefore its exact location within the body remains unknown.

In order to further investigate the nature of this object and to potentially establish a differential diagnosis, our analyses comprised X-ray, SEM and CT scanning. In addition we were able to compare the object with historic pathological specimens held in the pathological-anatomical collection at Narrenturm in Vienna, some of which could also be examined radiographically and through SEM and CT scanning. Our investigations revealed a large range of objects of similar appearance including calcifications of the thyroid, goitre, myofibroma and uteri.

Based on our examinations the calcified object associated with the male individual bears close similarities to a large calcified goitre or thyroid gland. However, it is not possible to reach a more conclusive diagnosis based on macroscopic investigation alone. Nevertheless, this research highlights the fact that a wide range of pathological conditions can cause tissue calcification. Historic medical records also indicate that they were a common medical problem and should perhaps be a more frequent finding in cemeteries. Their apparent absence in the palaeopathological literature might be due to difficulties in identifying such objects. Recording the precise location of such calcifications during the excavations should help establish more conclusive diagnosis.

Binois A. and Wardius C.

PhD candidates, Université de Paris 1 Panthéon-Sorbonne/UMR 7041 «Archéologies environnementales», Paris France.

Poster

A dog's life. Multiple trauma and potential abuse in a medieval dog from Guimps (Charente, France)

Keywords: *animal palaeopathology, dog, animal abuse, radius-curvus, Middle-Ages.*

Preventive excavations carried out around Guimps (Charente, France) in 2011 unearthed several medieval structures, including a silo containing a single dog burial. The animal, a young adult, exhibits numerous pathological bone modifications. Our poster presents a case study of the remains, which hold particular significance both from medical and from social perspectives.

Because of the state of dispersion in which animal remains are most often found, animal palaeopathology

is often unable to offer reliable diagnoses. The excellent preservation of these remains and the unambiguous lesions they display allow us here to achieve a true retrospective diagnosis and to demonstrate the presence of two independent pathologies, a radius-curvus and a medial patellar dislocation. These affections, though not uncommon in modern day pets, have of yet never been described in the zooarchaeological record.

The discussion explores the implications arising from these lesions on the animal's lifestyle and its relations with human society. The two aforementioned pathologies are here of traumatic origin, as are the many fractures the dog also displays. The possible causes of such multiple injuries are discussed, and the chronology of the lesions and their skeletal distribution are examined in the light of modern data. The pattern of injury leads us to suggest animal abuse as a probable cause, and to raise the question of attitudes towards domestic animals in the early Middle-Ages. Historical and statistical data show violence might have been frequent; as almost no comparable cases were found in the bibliographical record, the question of the identification of animal abuse in archaeology is addressed.

This poster is entered in the student Cockburn prize competition.

Blondiaux J.¹, Colard T.^{1,2}

¹Centre d'Etudes Paléopathologiques du Nord.

²Forensic Taphonomy Unit – Anthropology. Lille Forensic Institute. University Lille Northern France.

Poster

TCA and Adults Survival in Past Populations

In 2003, Wright pointed the issues of discordance between paleopathology and paleodemography: Clearly, resolution of the osteological paradox (Wood 1998) depends on better integration of paleodemography and paleopathology. Accurate age-at-death estimates are critical for interpreting the impact of pathological lesions on well-being at the population level. Analysis of pathological lesion abundance by age-at-death cohorts may be a useful approach for evaluating the significance of lesions in terms of morbidity and mortality. Future work in this area may permit us to better evaluate the changing nature of frailty through the age distribution and its impact on lesion frequencies. (Wright 2003). »

Our main goal is to test the previous recommendation with application of tooth cementum annulations method of determination of age to bio-archaeological series and pathological samples.

Skeletons were extracted from 23 sites, mainly

from Northern France. We studied a total of 1312 adult individuals.

Age at death was estimated with the tooth cementum annulations method (TCA) for 1037 of them. We assembled cohorts by chronology, social status, gender and for tuberculosis, cribra orbitalia and cribra femoris.

As shown previously for chronic diseases (cancer, cardiovascular diseases, diabetes) in modern populations, the survival rates of the affected populations do not differ greatly, though the impacts of social status, gender, tuberculosis appeared to be significant factors on life expectancy. The impact of diseases is indeed perceptible but there are other factors that may or may not be associated and much more deleterious to population survival and consequently to a quality of life index yet to be defined.

Bos K.I., Schueneman V.J., Poinar H.N. and Krause J.

Podium

A draft genome of *Yersinia pestis* from victims of the Black Death

Next-generation sequencing technologies have greatly expanded the scope of genetic analyses from ancient remains to the extent that genomic investigations are quickly becoming standard. This has important implications for palaeopathology since genomic data from ancient pathogens can help clarify which infectious diseases had close associations with humans in the past, and can provide valuable information regarding the evolutionary histories of these pathogens. Here we report a reconstructed draft genome of *Yersinia pestis* from victims of the Black Death from London, England (1348 – 1350), where 99% of the genome was obtained at a minimum of 5-fold coverage. Phylogenetic comparison against 18 modern genomes and polymorphic data from an additional 289 *Y. pestis* strains indicates that our ancient genome sits close to the root of all *Y. pestis* commonly-associated with human infection, with the most recent common ancestor dating to the 13th century at the earliest. This reveals that modern-day scourges of bubonic and pneumonic plague likely have their origins in the medieval era, and further suggests that the Black Death may have been the second *Y. pestis* epidemic to affect human populations. At our current resolution the reconstructed genome shows no unique derived genetic motifs, provisionally suggesting that factors other than bacterial genetics may be responsible for the perceived epidemiological differences between modern and ancient forms of *Y. pestis* infection. This supports the notion that factors such as environment,

vector dynamics, and host susceptibility should be central in epidemiological discussions of modern *Y. pestis* outbreaks.

Bouchez I.¹, Ardagna Y.¹, Georget G.², Chausserie-Laprée J.³ and Panuel M.^{1,4}

¹Laboratoire UMR 7268 - ADÉS - Anthropologie bio-culturelle, Droit Ethique et Santé, Aix-Marseille Méditerranée, Faculté de Médecine. Secteur Nord, Batiment A - CS80011 Bd Pierre Dramard 13344 Marseille Cedex 15 France.

²ArchéoLoire, Rue de Villejames 44350 Guérande France.

³Service archéologique de la ville de Martigues, Allée Henri Matisse F-13500 Martigues France.

⁴Service d'Imagerie Médicale, Hôpital Nord, Chemin des Bourrellys, 13915 Marseille France.

Poster

A case of mesomelic dysplasia in a simultaneous burial of three individuals

Keywords: *congenital disease, mutation, SHOX, paralysis, tibia.*

The archaeological site of La Place Neuve in Saint-Mitre-les-Remparts (Bouches-du-Rhône, France) is an old common cemetery. It was used from the early XVIIth century to May 1810 (according to the Municipal Archives). Excavations (made by G. Georget and J. Chausserie-Laprée in 2007) recovered 124 skeletons.

The distribution of age intervals is typical of a cemetery population: many immature subjects (young children) and old adults. Overall, the observed pathologies are also typical of this kind of population: mainly degenerative and traumatic lesions, and many dental disorders. Others pathological conditions (circulatory disorders, congenital anomalies, infectious or metabolic diseases) are not very well represented. Nevertheless, we have found one case of a very particular congenital disease.

Skeleton S.109 is from a simultaneous burial of three individuals (along with S.111 and S.120). It shows bone lesions allowing us to suspect a case of mesomelic dysplasia. This pathology is caused by mutations in the pseudoautosomal gene SHOX. It is characterized by limb shortening, and mainly involves the forearms and legs. The S.109 skeleton's lesions include short and wide tibiae with characteristic metaphyseal flaring and a curved left radius typical of Madelung's deformity. However, the diagnosis of this deformity is limited by the skeleton's state of preservation (the wrist bones were not found during the excavation). This individual also displays evidence of partial paralysis of the left side of the body, probably due to a neuropathology. The paralysis is defined by gracility of the humeral

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diaphysis, the forearm bones, and the femoral distal metaphysis on the left side of the skeleton.

Bouwman A., Warinner C., Link K. and Rühli F.

Centre for Evolutionary Medicine, Institute of Anatomy, University of Zürich.

Poster

The importance of sequencing: A case study of 'tuberculosis' amplification from 20th century skeletal remains

Biomolecular archaeology is used as a tool to identify individuals with different pathogenic diseases, e.g. *Mycobacterium tuberculosis* complex (MTBC) infection, in the past. Because of their success these studies have been expanded to strain identification in order to better understand the evolution.

Here we present a case study where MTBC specific primer sets have been applied to individuals from the Galler collection. This is a 20th century Swiss pathological collection. Ten individuals that had previously been diagnosed with tuberculosis were identified and bones sampled from the lesion site. After extraction, the DNA concentration was assessed and human and MTBC specific amplification attempted.

The DNA results were as expected, with 80% success of human mtDNA primers. The TB assays, however were variable. Products of the correct size were found in nine of the ten samples. However, only one assay produced sequences in four of the ten samples that could be matched with the expected sequence. However, the sequences from all four individuals had the same 13 single nucleotide polymorphisms, indicating a different, unknown, bacterial source.

We present the importance of sequence analysis in all ancient DNA research, especially within investigations of bacterial DNA where environmental contamination is a possible problem.

Buckberry J.¹, Holland A.¹, Gaffney C.¹, Holgate R.¹, Manchester K.¹, Ogden A.¹, Sparrow T.¹, Storm R.¹, Ugail H.², Watkins C.², Rawden A.³, Elias P.², Newbold T.², Ogbogu T.², Thompson J.², Keenan D.², Brown E.¹ and Wilson A.¹

¹Archaeological Sciences, University of Bradford.

²Centre for Visual Computing, University of Bradford.

³Chichester District Museum.

Poster

'From Cemetery to Clinic': 3D Digitised

pathological data from archaeological leprous skeletons

The 'From Cemetery to Clinic' project produced 3D laser scans of skeletons with leprosy from the medieval Leprosarium of St. James and St. Mary Magdalene, Chichester, UK. The collection is one of the largest published cemeteries with skeletal manifestations of leprosy. In addition, site plans, excavation data and radiographs were digitised and incorporated into an interactive website. The website also presents descriptions of the clinical manifestations of leprosy, alongside a valuable collection of clinical radiographs of leprous individuals.

The project aimed to ensure that fragile pathological remains can be accessed widely by students, the public and other diverse groups whilst having a low impact on the remains themselves. In addition the project aimed to provide globally accessible reference material for clinicians to aid their diagnoses of leprous changes in patients.

This poster presents the methods used to produce high-resolution, 3D digital models of the skeletal remains using a FARO Quantum arm 3D laser scanner and will examine the benefits and methodological challenges of combining the high resolution models with high-pixel count digital photography to accurately colour and texture a significant proportion of the models. Examples of the resultant scans will be showcased via laptop and iPad.

This project was funded by JISC under the rapid digitisation scheme.

Buckley H., Woodley S., Tsai R. and Stiles D.

Department of Anatomy, School of Medical Science, University of Otago, New Zealand.

Poster

The soft-tissue bony interface of tophaceous gouty arthritis

Keywords: *Erosive arthropathy, Gout, histology, modern donors.*

The musculoskeletal pathology of gout is characterized by deposition of monosodium urate crystals (MSU) causing tissue damage in the bone and soft tissues of joints. Diagnosing gout in skeletal material may be achieved through identification of characteristic lesions in dry bone but can be problematic because of similarities of the bone lesions with other erosive arthropathies. Also, the association between MSU deposits and soft tissues of the joint is not well understood meaning diagnosis of the disease in

isolated dry bone is difficult. The aim of this study was to investigate the relationship between soft tissues of joints and lesions of dry bone in individuals with gross joint pathology. The soft tissues, articular cartilage and bones of paired feet from five donors (1 male, four females; aged 70-92 years at death) were examined using radiography, macrodissection, histology and observation of the skeletonized bones. Three of the individuals had gross evidence of MSU deposits (tophi), confirmed by polarized microscopy, within soft tissue structures and the articular cartilage. Erosive bone lesions were observable in two of these individuals by radiography. Histologically, MSU deposits were found within the tendons and sheaths of flexor hallucis longus, the joint capsules and articular cartilage of the metatarsals and proximal phalanges. Observations of the bone showed that the three individuals with MSU deposits also had focal erosive bone lesions present. In one case there was a clear association between the MSU deposits and bony erosions in the foot and ankle. This descriptive study has demonstrated a relationship between MSU deposits, soft tissue pathology and bone erosions in gout not otherwise possible using these techniques in isolation. It has also shown the value of using modern cadaver material for addressing palaeopathological questions.

Buzhilova A.

Research Institute and Museum of Anthropology, Moscow State University.

Institute of Archaeology, Russian academy of Sciences.

Podium

Two cases of perimortem lesions of Upper Paleolithic individuals from Sunghir, Russia

Keywords: *Upper Paleolithic, trauma, perimortem lesions.*

The Upper Paleolithic Sunghir site is located near town Vladimir in northern European Russia. Two burials of an old adult (S1) and two immature individuals (S2 and S3) are from the most elaborate Paleolithic “red ochre” burials of known Gravettian archeological culture. Reanalysis of the skeletal remains of S1 and S2 by digital X-ray microfocus machine and micro-CT revealed perimortem trauma lesions.

The adult male has a perimortem incision in the ventral-lateral first thoracic vertebra body. On the surface it is 10 mm long and about 2 mm wide. Under X-ray microfocus imaging and micro-CT scanning of the vertebra, there is no sign of trabecular rounding. The injury penetrates at least 7mm into the body of the vertebra, so it is most likely a lesion caused by a sharp blade or pointed tool. There is no indication

of perimortem damage to other preserved bones. The anatomical position of the vertebral lesion is evidence that, in addition to the trauma to fit muscles, the lesion possibly impinged on the internal jugular vein and/or the common carotid artery. Damage of an even minor incision into one or both of these blood vessels would be fatal. Context indicates that the trauma was most likely from an accident or the result of ritual activity.

The early adolescent S2 has a possible perimortem lesion in the left ilium bone. It is an oval hole (about 10 mm long and 20 mm wide) on the anterior surface with additional postmortem defects. There are several cracks through the internal and external cortical bone, which converge on a hole. Under X-ray microfocus imaging there is no sign of sclerosis. Context indicates possible perimortem trauma by a sharp tool. Like in the first case the wound would be fatal as the result of rapid loss of the blood.

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Canci A.¹, Pulcini M.L.¹, Cupitò M.¹, Salzani L.² and Tecchiati U.³

¹Dipartimento dei Beni Culturali: Archeologia, Storia dell'Arte, del Cinema e della Musica, University of Padua (Italy).

²Nucleo Operativo Verona -Soprintendenza Archeologica per il Veneto (Italy).

³Soprintendenza Provinciale Beni Archeologici, Bolzano (Italy).

Poster

The Beginning of Horseback Riding in Prehistory: Suggestions from the Human Skeletal Remains

Keywords: *riding, Bronze age, palaeopathology, skeletal occupational markers.*

Bone remains of domesticated horse are documented in Italy from the beginning of the Eneolithic however it is in the course of the Bronze age that the archaeozoological evidences is more widespread to several settlements. The absence of butchery marks on bones and paucity of the remains seems to suggest a role as prestige good or perhaps war instrument of the horse rather than alimentary resource.

Aim of this presentation is to describe the results of an osteoarchaeological investigation on skeletal markers as enthesopathies, traumatic injuries and robustness of muscular insertions in human skeletons from the middle to recent bronze age necropolis of Olmo di Nogara (Veneto Plain, Italy).

We observed a constellation of skeletal indicators located on the vertebral column (wedge shaped aspect and/or compressions fractures of the thoraco-lumbar

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vertebral bodies and Schmörl herniations), hips (acetabular shape morphology), and femurs (adductor and gluteus muscles robustness, myositis ossificans traumatica at the linea aspera, Poirier facet and bone spurs at the throchanteric fossae) indicated by the palaeopathological literature as strictly related to horse raiding practices.

The anatomical completeness and the excellent conditions of preservations of the human bones provided useful informations especially if compared with the data obtained from similar observations performed on Palaeolithic/Neolithic and Medieval human skeletal series.

Carty N.

PhD Candidate in the Biological Anthropology and Bioarchaeology Research Group, Department of Archaeology, University College Cork, Ireland.

Poster

‘Losing Our Heads’: Osteological Evidence for Decapitation in Medieval Ireland

Keywords: *Osteological trauma, decapitation, violence, Medieval Ireland.*

This conference poster shall present osteological evidence for decapitation in fifty individuals from the medieval period in Ireland from twenty six archaeological skeletal assemblages which represent both the early (6th to 11th century) and late medieval (12th to 16th century) periods. The information presented on this poster represents a case study of a particular type of trauma within the broader framework of my PhD research which examines osteological evidence for violent trauma in general in both early and late medieval Ireland.

This study will present an examination of the spatial, temporal, and demographic distribution of burials displaying osteological evidence of decapitation. The type of decapitation and the mortuary practices associated with the burials of individuals showing evidence of decapitation will also be examined. Finally, assessments of the possible reasons for decapitation in Medieval Ireland and whether these decapitations represent judicial executions or are as a result of warfare shall be undertaken.

The information about medieval decapitations gleaned from these collections will be put in context of the corpus of historical information available about medieval Ireland specifically relating to violence and warfare (for example Graham 1975 and Thunder 1889). The osteological information will be added to the research that has already been carried out on

violence and warfare in medieval Ireland in relation to the written sources, weaponry, and fortifications (for example Finney 1998, Halpin 1986 and 2008, Simms 1975 and 1990).

By adopting this interdisciplinary approach, a fuller picture of violence and trauma in medieval Ireland can be created and the osteological data can be situated within the appropriate archaeological and historical contexts. This will add a new level to our understanding of the medieval period in Ireland and also to complement existing historiography of the period.

Čavka M.^{1,8}, Petaros A.^{2*}, Komnenic N.³, Reiter G.⁴, Speier P.⁵, Nielles-Vallespin S.⁶, Jankovic I.⁷ and Brkljacic B.^{1,8}

¹University Department of Diagnostic and Interventional Radiology in University Hospital “Dubrava”, Zagreb, Croatia.

²Department of Forensic Medicine and Criminalistics, Rijeka University, School of Medicine, Rijeka, Croatia.

³Medical School Zagreb, University of Zagreb, Zagreb, Croatia - Student.

⁴Siemens AG Healthcare, Graz, Austria.

⁵Siemens AG Healthcare, Erlangen, Germany.

⁶Cardiovascular MR Unit Royal Brompton and Harefield NHS Foundation Trust, London, UK.

⁷Institute for Anthropological Research, Zagreb, Croatia.

⁸University of Zagreb, Medical School, Zagreb, Croatia.

*presenting author

Poster

From paleoradiology to paleoimaging – comparing X-ray, computed tomography and magnetic resonance ultra-short-echo-time sequence imaging techniques in the study of ancient Egyptian mummies

Keywords: *mummy, paleoradiology, CT, X-ray, UTE-sequence, Egypt.*

Paleoradiological examination of ancient bones and mummified tissues is becoming increasingly important for the study of human remains, especially with regard to ancient pathologies. A number of significant discoveries have marked the history of the scientific study of mummies. Among the most important was the discovery of X-rays in 1895, which was immediately followed by its application to the scientific study of mummies. Another important step forward occurred in the late seventies, when the discovery of computed tomography was first applied to mummified corpses. In 2007 a new imaging approach for the analysis of dry mummified tissue was developed by Rühli et al. – the MRI ultra-short-echo-time (UTE) sequence. This

discovery opened a new chapter in the paleoradiological examination of mummies.

The aim of this study is to compare the three imaging techniques (their advantages and limitations in the study of mummified corpses), and to present our experience with the paleoradiological use of MRI-UTE sequence. The study was used to evaluate various soft and hard tissue landmarks and artefacts in 12 mummified parts and 4 complete mummified corpses curated in the Archaeological Museum in Zagreb, Croatia. In addition, the newly gained images were compared with conventional radiographs of the same mummies taken at the beginning of the nineties, to assess whether the new investigation has led to novel insights and/or disproved previous conclusions.

Besides demonstrating the possibility of gaining satisfactory MRI images from different samples of dry mummified tissue, this study pointed out the importance of concomitant use and proper selection of radiological methods with respect to the elements that are to be visualized. In conclusion, the significant differences detected between the first X-ray studies and the new X-ray/CT/MRI investigation indicate the need to verify the results of previous studies and to complement them with the capabilities of novel techniques.

Cervenkova L.¹ and Likovsky J.²

¹Department of Anthropology and Human Genetics, Faculty of Science, Charles University, Prague, Czech Republic.

²Department of the Archaeology of Landscape and Archaeobiology, Institute of Archaeology, Academy of Science of the Czech Republic, Prague, Czech Republic.

Poster

Developmental Anomalies of Vertebral Column in Celtic Populations of Central Europe (Czech Republic)

Keywords: *developmental anomalies, spine, La Tène period, Celts, Central Europe.*

In skeletal collections of historical populations, the majority of developmental anomalies can be found in the spine, the most frequently in the lumbosacral region. Presence of these developmental anomalies is mostly limited to minor defects that cause none or less severe health problems to their sufferers. The aim of this research was to study developmental anomalies of the vertebral column among Celtic populations from Bohemia and Moravia (Czech Republic). The skeletal collection is dated to middle La Tène period (375 – 190 BC), at the only time when inhumation was the dominant burial rite, and includes skeletons of 123 individuals of all ages. 1301 vertebrae and 59 sacral

bones were examined. The most frequent anomalies in this skeletal sample are congenital vertebrae blocks (5%), sacralization (4%) and lumbarization (4%). The other developmental defects (spina bifida atlantis posterior, costa lumbalis, spondylolysis and canalis sacralis apertus) occurred in only one individual each. The rare incidence of so common defects such as spina bifida occulta can be caused by poor preservation of this skeletal material. This study is a part palaeopathological and palaeoepidemiological research focused on documenting and analysing incidence of developmental anomalies in prehistoric and medieval populations living in the territory of Bohemia and Moravia (Czech Republic).

Cohen H., Slon V., Barash A., May H., Medlej B., Feldman M. and Hershkovitz I.

Department of Anatomy and Anthropology, Sackler faculty of medicine, Tel-Aviv University, Israel.

Podium

Ancient reliefs, bone trauma and present forensic case shed light on the Assyrian army brutality

Keywords: *torture, amputation, decapitation, Iron Age, Assyrian.*

The Assyrians, who ruled at the height of their power between Egypt and the Persian Gulf (900-612 B.C.), are known from historical records to have been cruel and unrelenting towards their enemies. As military prowess the Assyrians were considered a religious duty of the king. Reliefs found at Assyrians palaces provide vivid images and textual descriptions of their brutality, including flaying, dismembering (mainly hand amputations), skinning, decapitating and burning of their victims. However, osteological evidence for this is scarce.

We herein present a case of an adult male skeleton from the site of Kapin (Israel), dated to the Iron IIB period (1st half of the 8th century B.C.) who manifests traumatic injuries to the skull, left forearm bones, vertebrae and ribs. Using modern forensic methods, the injuries were studied and the consequences that led to these injuries (with the assistance of ancient reliefs) reconstructed. Two possible scenarios are present: (a) wounds inflicted during a battle; and (b) a violent commonly practiced attitude of Assyrian soldiers towards a captive combatant. Combining all the evidence at hand, the latter scenario appears more likely.

We provide a tangible proof that the textual and pictorial elements, detailing the atrocities committed

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by the conquering Assyrians, are indeed a historical truth. The man from Kapin may therefore be one of the sole tangible physical evidence for the veracity of the Assyrians' post-battle behavior, as depicted in ancient texts and reliefs.

Acknowledgment: We thank the Dan David Foundation and Tassia and Dr. Joseph Meychan Chair for the History and Philosophy of Medicine for their financial support.

Colard T.^{1,2}, Dole D.², Wallaert C.², Bertrand B.³, Blondiaux J.².

¹Forensic Taphonomy Unit – Anthropology. Lille Forensic Institute. University Lille Northern France.

²Centre d'Etudes Paléopathologiques du Nord.

³Laboratoire d'Anthropologie, Communauté d'Agglomération du Douaisis, Direction de l'Archéologie Préventive.

Poster

Blast trauma from a world war one mass grave

Keywords: *First World War, blast wounds, secondary burial.*

Archeological excavations of Saint-Laurent-Blangy (Northern France) by Alain Jacques in 1994 led to the discovery of a first world war mass grave, associated with french ammunitions and a Lebel rifle. From september 1914 through march 1916, Arras defenses were under french forces, followed by english forces. Firefights which occurred in this area might be at the origin of the mass grave.

The inventory of bones and ammunitions exhumed from the site of Saint-Laurent-Blangy allows us to set it as a french secondary burial, attributed to a « cleaning » of the battleground, that might have been done by german forces. The minimum number of individuals is six and most of them are young adults (18 to 30 year old), all male.

The traumatic pathology is rich with numerous wounds mainly caused by shrapnel shells. Macroscopic study and three-dimensional reconstruction from CTscan images allow us a better understanding of the mechanics that lead to Blast wounds.

Military Episode(s) leading to this secondary burial and events surrounding its building need a complete historical study, waiting for a more appropriate grave for these remains of young French soldiers.

Collins Cook D.

Department of Anthropology, Indiana University.

Podium

Evidence for Tuberculosis at Chirikof Island, Alaska, during the Fur Trade

Keywords: *Tuberculosis, Sacroiliitis, Taphonomy, Differential diagnosis.*

Wind erosion of graves dating to the Russian fur trade (18th and 19th century) has yielded a problematic collection of commingled human skeletons representing at least 75 individuals. Sand-scoured surfaces and plant growth in medullary spaces are taphonomic factors that complicate analysis. Vertebrae and other small bones are under-represented.

Two adult examples of unilateral childhood sacroiliac fusion and one adolescent sacrum with extensive destructive lesions and reactive new bone formation provide convincing evidence for tuberculosis. A fused tibia and fibula may reflect tuberculosis, but trauma and osteomyelitis must be considered. Destructive lesions of the cranial vault occur in several persons. While treponematosi is the most plausible agent for these lesions, one of them might be attributed to tuberculosis. Differential diagnosis includes treponematosi, and in the case of the sacrum, brucellosis, hydatid disease and non-specific osteomyelitis. At least three people had chronic conditions compromising locomotion as a result of their illness.

Efforts at extracting pathogen DNA from the tuberculosis cases and mitochondrial DNA from a collection of dog skeletons from the island were unsuccessful. Despite the good preservation and relatively recent origin of these remains, extensive weathering has compromised these biomarkers.

This evidence is examined in the light of recent scenarios for the introduction of tuberculosis and treponematosi into Alaska. Robert Fortune's remarkable book *Must We All Die?: Alaska's Enduring Struggle with Tuberculosis* must account for only the last phase of a longer experience with epidemic tuberculosis.

Colombo A.¹, Demangeot C.^{1,2}, Coqueugniot H.^{1,3}, Dutour O.^{1,4} and Carme R.⁵

¹UMR 5199 PACEA - A3P, Université Bordeaux 1, bâtiment B8, avenue des facultés 33405 Talence cedex, France.

²Hadès, 60-64 Cité Reinette 33100 Bordeaux, France.

³Max Planck Institute of Evolutionary Anthropology, Department of Human Evolution, Leipzig, Germany.

⁴EPHE - Laboratoire de paléanthropologie – UMR PACEA & Department of anthropology University of Toronto, Canada.

⁵Hadès, 31 rue Vidailhan 31130 Balma, France.

Poster**Metaphyseal porosity on perinatal individuals: physiology versus pathology****Contribution of microtomodensitometric analyzes to Saint-Gilles skeletal series (Gard, France)**

Keywords: *periosteal reaction, normal growth, periostitis, μ CT-scan.*

Most of the stress indicators (periosteal reaction, enamel hypoplasia, cribra orbitalia ...) used to evaluate the health status of past populations is unspecific. Furthermore, it seems that some criteria interpreted as stress indicators could be linked to a normal growth process. Periosteal reaction is one of them, being frequently interpreted as periostitis, due to a general pathological condition, that is attributed most of the time to infectious process.

In order to check if morphological differences can be evidenced at the microstructural level between physiological and pathological aspects, we have carried out a micro-CT analyzes of long bones of very young immature individuals coming from the Saint-Pierre cemetery (Saint-Gilles, Gard, France) which contains 221 burials. Among the 132 individuals excavated, 17 are less than 1 year-old. The three upper limb long bones (humerus, radius, ulna) of 3 immature individuals, aged between 30 and 45 weeks *in utero* were chosen for representing different stages of the macro-morphological expression of periosteal reactions in the series, having in common porotic changes and "foamy aspect" of the metaphyseal region. These bones were micro-CT-scanned to a 20 μ m resolution. Two individuals (# 107 and # 163) exhibit microstructural changes, characterized by an increasing of capillary vascularization of cortical bone and related porotic changes at the surface of the subperiosteal bone. The individual # 131 presents, in addition to a densification of the metaphyses, periosteal lamellar appositions that can be easily differentiated from the microporotic aspect of the two other individuals. It is suggested that the latter is corresponding to normal growth process. We discuss about the possibility, when observing similar macro-morphological changes of periosteal reaction on young immature bones, to differentiate between normal growth and pathological condition, thanks to microtomodensitometry.

Coqueugniot H.^{1,2}, Dutailly B.¹, Desbarats P.³ and Dutour O.^{1,4,5}

¹UMR 5199 PACEA, Bat B.8, Université Bordeaux 1, Avenue des facultés, 33405 Talence cedex, France.

²Department of Human Evolution, Max Planck Institute for Evolutionary Anthropology, Germany.

³UMR 5800, LaBRI, Université Bordeaux 1, 351 cours de la Libération, 33405 Talence cedex, France.

⁴Laboratoire de Paléanthropologie, Ecole Pratique des Hautes Etudes, France.

⁵Department of Anthropology, University of Toronto, Canada.

Podium**VIRCOPAL® (VIRtual Collection of PALeo-specimens) : 3D ressources for teaching and research in Paleopathology**

Keywords: *Heritage preservation, Training packages, Rapid prototyping, Pathological processes, Virtual bone library.*

Virtual tri-dimensional reconstruction of original specimens contributes to their preservation and broadens the means of research, teaching and exchanges in the field of paleontology and physical anthropology.

We have developed a specific 3D digital chain (acquisition - reconstruction - printing) dedicated to anthropology, using a specific software program (TIVMI), characterized by its accuracy and reliability. This chain has been named VIRCOPAL® standing for VIRtual Collection of PALeo-specimens.

The goal of this presentation is to illustrate the interest of this 3D digital chain to paleopathology for these "3Ds" purposes : Diagnosis, Didactic and Diffusion.

We have digitalized, by using CT scan (Siemens SomatomTM) or micro-CT scan (GE Computed TomographyTM), paleopathological specimens corresponding to different pathological processes ; the images were reconstructed by TIVMI and finally printed on a high resolution 3D printer (Objet -Eden 250TM). These specimens can be reconstructed and printed on demand for research, training and exhibitions.

Results are presented in specific training packages corresponding to infectious, tumoral, traumatic, metabolic, degenerative and inflammatory processes among others. In addition, original digital data are available on DVD as well as printed paleopathological specimens including their digital sections, enlargement and extraction of regions having specific interest for diagnosis in paleopathology.

Craps D.

Archaeology Department, Durham University, Durham, UK.

Podium**Erosions in the Spotlight: A Revision of the**

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Evidence for Rheumatoid Arthritis

Keywords: *joint disease, clinical studies, erosive arthropathy.*

In modern medical practice, rheumatoid arthritis is one of the most common forms of joint disease. In palaeopathology, however, it is believed to be a rare find in skeletons and the subject has received comparatively little attention. The origin and history of the disease is uncertain. Rothschild (1988; 1990) has described multiple cases of rheumatoid arthritis in Native Americans from 3000-5000 years ago. Medical historians have suggested a more recent origin for the disease in Europe, though there is evidence for a pre-contact European presence (Molleson 1987; Hacking et al. 1994; Blondiaux et al. 1997). This presentation will synthesise the palaeopathological, historical and clinical evidence for rheumatoid arthritis in order to illuminate a neglected condition in past skeletal remains. Several questions will be addressed: What evidence is there for rheumatoid arthritis in the palaeopathological research record? How can historical research help the debate on the origin of rheumatoid arthritis? What can the advances in clinical research contribute to studying the palaeopathology of rheumatoid arthritis? This research aims to provide new insights into a condition that is, still, not well understood.

Craps D.

Archaeology Department, Durham University, Durham, UK.

Poster

Anatomical Patterning in Degenerative Joint Disease

Keywords: *porosity, osteophytes, joint contour change, North England, Post-Medieval.*

A variety of etiological factors result in degenerative changes to the joints over time. It is possible to subdivide joints into compartments based on the type of movement they perform. Ball-and-socket joints, like the hip and the shoulder, can be subdivided into a mobile compartment, the heads of the femur and the humerus respectively, and a stable compartment, the acetabulum and the glenoid fossa. Hinge joints like the elbow and the knee can be subdivided into a medial and a lateral compartment. In Jurmain's (1977) study of the Terry collection he divided the knee into medial and lateral compartments and found a differential distribution of degenerative changes. This phenomenon has not been examined extensively and the research presented here identified the differential distribution through a detailed examination of joints for a larger study into osteoarthritis. This interesting find merits attention and

is a new direction of research into degenerative joint disease. The examined population is from Fewston, North Yorkshire, UK. It is an important site because it is a northern, Post-Medieval rural community, one of the few that is available for research. The results from this study show that hinge joints and ball-in-socket joints display differential patterning of degenerative changes. In the latter joint type, the stable compartment is more commonly affected by changes than the mobile compartment. In hinge joints the knee showed that the lateral compartment was more affected, whereas the elbow displayed a differential picture between the left and right sides. This poster presents results from an ongoing project that examines degenerative joint disease in a new and holistic way.

Curate F.^{1,2}, Ferreira T.³ and Cunha E.^{2,3}

¹Research Centre for Anthropology and Health – University of Coimbra.

²Centro de Ciências Forenses – Instituto Nacional de Medicina Legal IP.

³Department of Life Sciences – University of Coimbra.

Poster

Vertebral Compression Fractures: Towards a Standard Scoring Methodology in Paleopathology

Keywords: *vertebral compression fractures; scoring methods; reproducibility; paleopathology.*

Vertebral compression fractures are the most common osteoporotic fractures in postmenopausal women. Notwithstanding, its clinical diagnosis remains ambiguous. In paleopathological studies vertebral fractures and/or deformations are frequently ignored. When observed, vertebral compression fractures are usually recorded without the support of quantifiable and comparable protocols. As such, a semi-quantitative method for vertebral compression fracture assessment (Genant et al., 1993) was applied to a large sample (N=198) from the Coimbra Identified Skeletal Collection and the reproducibility of the method was tested. Vertebral fracture scoring agreement was evaluated with the Kappa statistic and the percent of agreement (%A). Intra-observer and inter-observer agreement are both very high. The Genant's semi-quantitative scoring methodology is easy to apply and highly reproducible; as such, it should be adopted as the standard method to score vertebral fractures/deformations in any paleopathological enquiry.

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quantitative technique. *Journal of Bone and Mineral Research*, 8: 1137-1148.

Czermak A.¹, Czermak Ad.², Grupe G.³ and Ernst H.²

¹Institute for Archaeological Sciences, Department of Early History and Medieval Archaeology, Albert-Ludwigs-University Freiburg, Germany.

²Faculty of Computer Sciences, University of Applied Science Rosenheim, Germany.

³LMU Biocenter, Department Biology I, Anthropology and Human Genetics, Ludwig Maximilian University of Munich, Planegg-Martinsried Germany.

Poster

Age at death evaluation by tooth cementum annulation (TCA) – software for an automated line counting

Keywords: *Tooth cementum annulation (TCA), automated line counting, custom-made software (AutoTCA), incremental lines, image processing.*

A valid age at death estimation is required in historical and forensic anthropology. Tooth cementum annulation (TCA) provides a technique for age-at-death estimation of adult individuals. The approach uses light microscopic images acquired from tooth root cross sections. Age is estimated by counting the number of visible tooth cementum incremental lines and adding the result to the assumed age of tooth eruption. Manual line counting, however, is time consuming, potentially subjective and the number of individual counts is insufficient for quantitative evaluations.

Here a custom-made software (AutoTCA) is presented that allows automated evaluation of TCA images. It involves Fourier filtering, “line-by-line” scanning and the counting of grey scale intensity peaks within a selected region of interest (ROI). Each scanning process of a particular ROI yields up to 400 counts, thus minimizing the potential error induced by manual line counting. This simple and time saving program can substitute manual counting and provides reproducibly consistent and user independent unbiased results.

Reliability of the results, however, still depends largely on the state of preservation of the analysed material, the preparation, the choice of the thin section and image quality, underlining the need to standardize these factors.

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Czermak A., Fehr H. and Brather S.

Institute for Archaeological Sciences, Department of Early History and Medieval Archaeology, Albert-Ludwigs-University Freiburg, Germany.

Poster

Wealth, Status and Prosperity – Biological Evidence of Social Structures at an Early Medieval Burial Site?

Keywords: *Social structures, isotope analysis, physical stress, demography, Early Middle Ages.*

In this study the early medieval separated burial site of Bruckmühl (Bavaria, Germany) was subjected to a joint archaeological and anthropological examinations (n=39).

Separated burial sites are small cemeteries (30-40 inhumations), typical for the Bajuvarian and Alamannian region in the Late Merovingian period (7th-8th century AD). This new type of sepulture differed from common row graves in characteristic tomb construction and rich burial furnishing. Archaeological findings indicate outranking social status of the individuals, suggesting an expression of social stratification.

We addressed the question whether biological parameter, such as life expectancy, physical stress and quality of nutrition, correlate with the archeologically determined social status. The morphological analyses focused on joint disease, assuming that social status correlates with the frequency and severity of joint degeneration and physical activity pattern. Furthermore, diet was reconstructed by analyzing C/N-isotope ratios from bone collagen assuming that a mainly animal protein based diet consisting of rather expensive meat and/or dairy products was likely reserved to wealthy persons and therefore indicate social status.

The demographic reconstruction revealed low infant mortality. The comparatively low life expectancy is related to the lack of elder people, which however could also be explained by cultural terms, such as burying elder people after old rituals.

Isotope analyses, however, revealed compelling evidence for some individuals that were in accordance to the archeological classification of social status. In contrast, physical stress did not reveal any correlation, arguing that physical stress depends on individuals' activity, working pattern and disease rather than being linked to social status.

This study implies that social rank, as defined by grave goods, correlates with some biological indicators such as infant mortality and nutrition, but not with physical stress pattern. Any applied methods cannot be used as single indicators, but a combination of

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complementary anthropological and archaeological methods is absolutely required.

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Czermak A., Masanz R. and Brather S.

Institute for Archaeological Sciences, Department of Early History and Medieval Archaeology, Albert-Ludwigs-University Freiburg, Germany.

Poster

Age at death evaluation of urn burials (Friedenhain-Přešťovice type) from the Late Roman and Migration Period - TCA applied to cremated teeth using automated line counting (Auto-TCA)

Keywords: *Tooth cementum annulation, automated line counting, cremated teeth, urn burials, Migration Period.*

Aim of this project was the application of TCA on cremated teeth, investigating remains of cremated individuals from the Late Roman and Early Migration Period urn cemetery of Forchheim (Bavaria, Germany; dated about 3rd to 5th century AD, ceramic-type Friedenhain- Přešťovice). Cremation burials were common for a long period in central Europe, from Bronze Age up to the Early Middle Ages. Thus cremation remains often provide the only source for biological investigations on individuals and populations. The possibilities of research mostly depend on the level of incineration and the degree of preservation. As the potential of morphological age determination generally is quite low for often poorly preserved cremation remains, we focussed on teeth, which are available in several urn burials.

Tooth cementum annulation (TCA) is a common method for age at death estimation of adult individuals, using light microscopic images acquired from tooth root cross sections. The age is estimated by counting the number of visible tooth cementum incremental lines and adding the result to the assumed age of tooth eruption. TCA of cremated teeth had been controversial discussed in previous work in terms of visibility of the rings and reliability of the counting results in relation to the degree of preservation.

Applying a custom-made software for automated line counting (AutoTCA), we obtained reproducible results and were able to apply a quantitative evaluation of incremental lines. This also allowed a comparison of incineration level, image quality and validity of the counting results.

Reliability of TCA-results, however, heavily depends on the state of preservation of the teeth, preparation, choice of thin section and image quality.

We conclude that, depending on the incineration level, TCA provides a useful method for age estimation on cremated material with the caveat, that the result has to be seen as a “minimum age at death”.

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Dageförde K.¹, Vennemann M.² and Rühli F.J.³

¹Medical Faculty, University of Münster, Germany.

²Institute of Legal Medicine, University of Münster, Germany.

³Centre for Evolutionary Medicine, Institute of Anatomy, University of Zürich, Switzerland.

Poster

“Evidence-based Palaeopathology”: Meta-analysis of Pubmed®-listed scientific. Studies on Pre-Columbian, South American Mummies

Keywords: *Mummies, paleopathology, soft tissue, meta-analysis, history.*

The aim of our study was to review all Pubmed®-listed palaeopathological studies performed on Pre-Columbian South American Mummies. A total of 61 studies have been found (1977-2005). Review criteria include e.g. method of examination, method of mummification, palaeopathological diagnoses and individual age of mummies as well as historical age, which ranges from 7500 – 500 years BP (mostly if reported from the Chiribaya and Chinchorro culture). The average age of 99 individually reported mummies was ca. 25 years. Only six studies included computed tomography, thirteen studies used classical x-ray as examination method. Three studies analysed parasitological related diseases, especially *Trypanosoma cruzi*. Among all reported infectious diseases (n=9), there are seven studies presenting cases of tuberculosis. We also compared our results inter-culturally: In 61 studies (24 case reports and 37 epidemiological studies) more than 6400 mummified individuals were analysed. In contrast, meta-analytic data for Ancient Egyptian mummies (Zweifel et al., 2006) showed about 3000 analysed individuals in 131 studies (85 case reports and 46 epidemiological). Ancient Egyptian mummies were shown to be intentionally mummified overall, whereas the given Pre-Columbian mummies showed a great variety in terms of spontaneous mummification. However, ritualistic mummification methods were practised, too (n=2). This meta-analysis shall help to improve evidence-based research in palaeopathology in general.

Dar G.^{1,2}, Masharawi Y.^{2,3}, Peleg S.², Steinberg N.^{2,4}, May H.², Medlej B.², Peled N.⁵ and Hershkovitz I.^{2,6}

¹Department of Physical Therapy, Faculty of Social Welfare & Health studies, Haifa University, Mount Carmel, Haifa 31905, Israel.

²Department of Anatomy and Anthropology, Sackler Faculty of Medicine, Tel-Aviv University, Tel-Aviv 69978, Israel.

³Spinal Research Laboratory, Department of Physical Therapy, School of Health, Tel-Aviv University, Tel-Aviv 69978, Israel.

⁴Zinman College of Physical Education and Sports Sciences, Wingate Institute, Netanya, Israel.

⁵Department of Radiology, Carmel Medical Center, Haifa 34362, Israel.

⁶Cleveland Museum of Natural History, Cleveland, OH, USA.

Podium

Schmorl's nodes distribution in the human spine – a skeletal study

Keywords: *Spine, Spinal diseases, Intervertebral disc, Spine pathology, Disc herniation.*

Although Schmorl's nodes (SNs) are a common phenomenon in the normal adult population, their prevalence is controversial and etiology still debatable. The objective was to establish the spatial distribution of SNs along the spine in order to reveal its pathophysiology. In this study, we examined two hundred and forty human skeleton spines (T4-L5) (from the Hamann-Todd Osteological Collection) for the presence and location of SNs. To determine the exact position of SNs, each vertebral body surface was divided into 13 zones and 3 areas (anterior, middle, posterior). Our results show that SNs appeared more frequently in the T7- L1 region. The total number of SNs found in our sample was 511: 193 (37.7%) were located on the superior surface and 318 (62.3%) on the inferior surface of the vertebral body. SNs were more commonly found in the middle part of the vertebral body (63.7%).

No association was found between the SNs location along the spine and gender, ethnicity and age. This study suggests that the frequency distribution of SNs varies with vertebra location and surface. The results do not lend support to the traumatic or disease explanation of the phenomenon. SNs occurrences are probably associated with the vertebra development process during early life, the nucleus pulposus pressing the weakest part of the end plate in addition to the various strains on the vertebrae and the intervertebral disc along the spine during spinal movements (especially torsional movements).

De Boer H.H.¹, Van der Merwe A.E.², Steyn M.³ and Maat G.J.R.¹

¹Barge's Anthropologica Leiden. Dept. of Anatomy and Embryology, Leiden University Medical Center.

²Barge's Anthropoloigca Amsterdam. Dept. of Anatomy, Embryology and Physiology. Amsterdam Medical Centre.

³Forensic Anthropological Research Centre, Dept of Anatomy. University of Pretoria.

⁴Barge's Anthropologica Leiden. Dept. of Anatomy and Embryology, Leiden University Medical Center.

Podium

Assessing post-traumatic survival time in human dry bone

Keywords: *Trauma, survival, histology, radiology, human dry bone.*

The post-traumatic status of antemortem fractures in human dry bone remains is currently defined as being either 'healing' or 'healed'. However, detailed 'dating' of the related post-traumatic time interval would be desirable, since it would aid in assessing individual medical status and care at the time of death. Within forensic pathology practice, fresh tissue healing phases are routinely used as an intrinsic parameter for the length of the post-traumatic time interval. Unfortunately, the direct application of such a method is less effective when applied to dry bone skeletal material.

This study explores the possibility of applying a fracture dating system, drawn forth from the traditional forensic pathology method, on dry bone remains. More specifically, to establish the extent to which various morphological features indicative for specific time intervals of healing are consistently detectable.

Results show that the complementary use of radiological and (un)stained histological investigation techniques improves the differentiation between various healing phases and thus allow for a more detailed dating of lesions. For future use, healing features that have proven to be consistently detectable and their related post traumatic time intervals are listed. The system aids in demarcating a considerably more "narrow" post-traumatic time interval than usual.

Delhopital N.

Archéologies et Sciences de l'Antiquité-UMR 7041.

Poster

Sacralization of the fifth lumbar vertebra in the Nabataean tomb IGN 117 in Mada'in Salih (Saudi Arabia)

Keywords: *Sacralization of the fifth lumbar vertebra,*

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discret character, pathology, nabataean, Saudi arabia.

The Nabataeans were a people living in the area corresponding to the current southern Syria, Jordan, northwest of Saudi Arabia and Israel. They were especially prosperous in the 1st century B.C. and A.D. Mada'in Salih is the most important site after Petra (Jordan). It was a major metropolis, caravan city, agriculture place, cemetery and place of worship. Tomb IGN 117 contains a burial chamber of 25 sq. m. with a 1.30 m deep pit-tomb inside. The calibrated radiocarbon dates place the use of the tomb in the 1st century A.D. The excavation of the tomb IGN 117 started in 2009 and it ended in 2011. It led to the discovery of seventy-four individuals, including forty-eight adults, with a distribution of thirteen men, thirteen women and twenty-six immatures.

In the tomb IGN 117, the frequency of the sacralization of the fifth lumbar vertebra is by 37%. In populations past and present this rate rarely exceeds 10%. In the tomb IGN 117, the sacralization is mostly complete. When the sacralization is unilateral, it is usually right. Form unilaterally may cause clinical complications secondary causes pain in lower back, which may cause difficulty in obstetrics. Indeed, the curvature and rotation of the vertebrae after the sacralization of the fifth lumbar vertebra can lead to scoliosis, to osteoarthritis, etc. more frequently and more severely on the unaffected side but more susceptible to pain. However the fact that the sacralization cause such consequences remains controversial. It is possible that the individuals buried in this tomb have been family relationship since this character has genetic origins.

Devriendt W., Vatteoni S. and Bertrand B.

Laboratoire d'Anthropologie, Communauté d'Agglomération du Douaisis, Direction de l'Archéologie Préventive, 227 rue Jean Perrin, 59500 Douai, France.

Poster

Archaeological evidence of the 18th century practice of anatomical dissection – Saint-Jacques cemetery (Douai, Northern France)

Excavations of the Saint Jacques Parish Church (Douai, France) undertaken in 2007 revealed some two thousands burials. In the confusing mix of bones from the dense cemetery were surprising evidences for the way that bodies were dissected or autopsied in the eighteenth century.

Sawed skulls and long bones, but also connected body parts, indicate that some bodies apparently served as anatomical specimens and are archaeological

evidences for anatomy at the Douai University which flourished between the 16th and the 18th centuries. There, official dissections were decided by the dean of the faculty and conducted by Medical Doctors on bodies supplied by the legal system but also surely on material from graves. This archaeological discovery reveals a previously unknown view of the links between the practice of anatomical dissection in Douai and the cemetery management in this period.

Dating at the latest from the end of the eighteenth century, this discovery is one of the most significant in France and offers a fresh insight into 18th century dissection and the use of dead bodies.

Dong Hoon Shin¹, Chang Seok Oh¹, Myeung Ju Kim², Yi-Seok Kim³, Soong Deok Lee⁴ and Min Seo⁵

¹Anthropology and Paleopathology Lab, Institute of Forensic Medicine, Seoul National University College of Medicine, 28 Yongon-Dong, Chongno-Gu, Seoul 110-799, Republic of Korea.

²Department of Anatomy, Dankook University College of Medicine, San 29, Anseo-Dong, Chonan 330-714, Republic of Korea.

³Department of Anatomy, Ewha Womans University School of Medicine, 911-1, Mok-5-dong, Yangcheon-gu, Seoul 158-710, Republic of Korea.

⁴Department of Forensic Medicine, Seoul National University College of Medicine, 28 Yongon-Dong, Chongno-Gu, Seoul 110-799, Republic of Korea.

⁵Department of Parasitology, Dankook University College of Medicine, San 29, Anseo-Dong, Chonan 330-714, Republic of Korea.

Podium

Studies on human health and disease based on paleoparasitological examination of archaeological specimens from Korea

Keywords: *Paleoparasitology, ancient DNA, Disease, Archaeological Sample, Korea.*

Paleoparasitological studies have been performed not only to find evidence for specific parasitic infections from archaeological samples, but also to see if any socio-economic factors influenced infection. Ancient parasite studies can have a very important contribution to the knowledge of historical sanitation and parasitism. Although paleoparasitology is a quickly developing science, reports from East Asian countries are lagging behind in number when compared with the situation in Europe and the Americas. Paleo-parasitologists in Korea thus have examined pre-modern samples (sediments and coprolites) from various archaeological sites in Korea. In our previous studies on the samples, we discovered the ancient parasite eggs of *Trichuris trichiura*, *Ascaris lumbricoides*, *Clonorchis sinensis*,

Metagonimus yokogawai, *Gymnophalloides seoi*, *Paragonimus westermani*, *Strongyloides stercoralis*, and *Trichostrongylus* spp. Additional studies also showed that the genetic information remained in those of ancient parasite eggs could be successfully obtained, amplified, and sequenced by ancient DNA analysis. Our studies are significant to concerned researchers because the paleoparasitological information obtained by could serve as a window into parasite infection history in historic East Asian populations. This study was funded by the National Research Institute of Cultural Heritage, Korea (NRICH-1207-B03F).

Dufour B. and Le Bailly M.

University of Franche-Comte, CNRS UMR 6249 Chrono-Environment, 16 Route de Gray, 25030 Besancon cedex, France.

Poster

Tests of new extraction methods in Paleoparasitology and an attempt at quantification

Keywords: *Paleoparasitology, Helminth eggs, Extraction method, Quantification.*

Several methods are used in Paleoparasitology to extract parasite eggs. Initially, these methods derived from medical coprology based on sedimentation, centrifugation, flotation or diphasic separation. However, these techniques can't be used without adaptation because of the archaeological nature of the sample itself. Taphonomic processes can mineralize and can rupture parasite eggs making their chemical and physical properties change.

In our laboratory, samples are rehydrated for ten days in a solution composed with aqueous trisodium phosphate and glycerinated solution. Some drops of formalin are added to avoid fungi or algae development. Material is then crushed in a mortar and treated with ultrasound. Finally samples are filtered through a column composed of four meshes of 315 µm, 160 µm, 50 µm and 25 µm. The last two screenings are placed in a tube with water and some drops of formalin solution. Each sample is examined under the microscope to identify parasite eggs. While this method allows recovering all type of eggs, it also concentrates all other elements presented in the initial sample like pollens, fungi, charcoals and woods, diatoms, insect remains, minerals, etc.

In order to try to purify these preparations, several chemical reagents have been tested, based on palynological techniques. Eight combinations of acids and bases have been tested and compared to evaluate the effect on ancient eggs. We finally tried to adopt a

quantitative approach, in order to propose a standard method to study parasite eggs in archaeological samples.

Dutour O.

Laboratoire Paul Broca – Laboratoire d'Anthropologie biologique de l'École Pratique des Hautes Etudes – UMR PACEA – Avenue des Facultés, 33405 – Talence Cedex.

Plenary lecture

Paleopathology and paleoepidemiology of human pathogens: interdisciplinary research from bones to molecules.

Paleopathologists are now convinced about the usefulness of interdisciplinary collaborations for studying the past of diseases and more specifically the past of infections.

The evolution of human infections and the responses of societies, ancient and modern, to treat and find protections from pathogens is a research topic shared by specialists belonging to different scientific fields.

As the improvement in knowledge of past infections is the key for understanding the present and future of these diseases, microbiologists became recently more interested in osteoarchaeological collections. Paleomicrobiology which emerged in the early 90's became in two decades a new discipline that brought some decisive contributions by identifying molecular signature of some past epidemics.

New scientific networks are growing up, connecting archeologists, biological anthropologists, historians of medicine and sociologists together with geneticists, microbiologists, evolutionary biologists and molecular biologists. From humanities to biology, history can ask specific questions (such as the origin of the Athen's plague) and ancient selected material can be supplied by archaeology and anthropology to molecular biology. The latter can bring new answers to long-time debated questions by identifying ancient pathogens. Reciprocally, from biology to humanities, molecular phylogenies recently drew up new models of pathogen evolution (such as for tuberculosis) that need archaeological material to be validated.

Paleopathology has a central role to play in connecting all these specialists, due to its long experience in practicing interdisciplinary between biomedical sciences and sciences of the past.

Economou C.¹, Kjellström A.², Lidén K.¹ and Panagopoulos I.¹

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¹Archaeological Research Laboratory, Stockholm University, Sweden.

²Osteoarchaeological Research Laboratory, Stockholm University, Sweden.

Podium

Ancient-DNA reveals an Asian type of *M. leprae* in medieval Scandinavia

Keywords: Ancient DNA, Leprosy, Scandinavia, Palaeopathology, Microbial Phylogeography.

Leprosy has been one of the most talked-about diseases that have plagued mankind. The impact that it had on past populations can be deduced from the various references that can be found in texts dated as far back as 600 BC in India, descriptions by ancient Greek and Roman physicians, the leprosaria that were founded in Europe during the Middle-Ages and the Biblical stories among others. Thought to have originated in Asia and reached the Mediterranean with the army of Alexander the Great returning from its campaign, it became prevalent in Europe in the 12th-13th centuries AD, with a subsequent decline in the continent. The condition persisted in areas of Scandinavia until the 19th century. After the initial stages, the infection can affect the skeleton leaving deformities that are indicative to the osteoarchaeologists. Ancient-DNA analysis have proven to be a powerful tool in the studies of palaeopathology as -apart from the actual presence of the microorganism- it can refer to its evolution and the phylogeography patterns that a disease follows.

In this study, *M. leprae* DNA sequences were successfully extracted from human remains found in Medieval Sweden showing not only the existence of leprosy in the region at this time, but also a type of pathogen not previously found in Europe. Previous studies on the various genetic profiles of the bacterium around the world using modern, as well as ancient, samples, have shown the existence of a number of distinct types and sub-types of the pathogen, regarding its evolution and spatial distribution. Our results show the presence of a type of *M. leprae* that so far had only been found in Middle-East, implying that a transmission took place, affecting that population in Scandinavia.

Erekat S.^{1,2*}, Bar-Gal G.K.², Nasereddin A.¹, Greenblatt C.L.³, Azmi K.¹, Sarie I.¹, Spigelman M.⁴ and Abdeen Z.¹

¹Al-Quds Nutrition and Health Research Institute, Faculty of Medicine, Al-Quds University, Abu-Deis, the West Bank, Palestinian Authority.

²The Koret School of Veterinary Medicine, The Hebrew University of Jerusalem, Rehovot, Israel.

³Department of Microbiology and Molecular Genetics, The

Hebrew University-Hadassah Medical School, Jerusalem, Israel.

⁴Department of Infection, University College London, London, United Kingdom.

*Corresponding Author

Podium

Molecular detection and identification of *Mycobacterium tuberculosis* in an early Bronze age skeleton from Tell es-Sultan, Ancient Jericho

Keywords: Jericho, Bronze age, tuberculosis, IS6110, Mycolic acid.

Introduction: Jericho offers a unique chance to observe a nearly complete habitation record from the early Neolithic sedentary villages (8000 BC) to the end of the urban cities (end of the Middle Bronze Age ~1450 BC). Here, we described the molecular identification of *M. tuberculosis* complex DNA in a bone tissue sample which was recently excavated in 2010 from the area of the presumed cemetery of old Jericho, that is now heavily populated by Palestinian refugees.

Methodology and findings: A total of 23 human bone fragments that were obtained from five skeletons (dated back to the early bronze age) were tested for the presence of the *M. tuberculosis* (MTB) complex, based on the insertion elements IS6110 and IS1081, which are normally multi copy, thus increasing the likelihood of detection. The MTB DNA was detected in two rib samples obtained from the same skeleton (JE010/SK1). The specificity of the amplified product was confirmed by digestion reaction using HaeIII enzyme. Additional nested PCR was used to amplify a 92 bp fragment of IS6110. The full sequence of 92 bp was identified by cloning and sequencing; one clone showed 100% identity with modern MTB DNA held in NCBI and the other showed a G/A transition at position 25. Stringent precautions were taken against contamination and the High Performance Liquid Chromatography was used as independent method of verification. Mycolic acid lipid biomarkers, specific for MTB complex were detected in the same sample. The spoligotyping pattern was inconsistency with any known modern genotype in the international Database spolldb4, as might be expected of ancient specimens.

Conclusion: Human tuberculosis was confirmed by molecular and chemical methods in ancient Jericho. The study of ancient human remains for microbial pathogens help in understanding the host/pathogen relationship and provides aDNA sequences that can be compared with those of modern isolates.

Participation for the Cockburn prize.

Farina I., Chavarria Arnau A., Brogiolo G.P. and Canci A.

Dipartimento dei Beni Culturali: Archeologia, Storia dell'Arte, del Cinema e della Musica - Università degli Studi di Padova, Italy.

Poster

A medieval privileged burial from the episcopal complex of Padua (Italy). Palaeopathological considerations

Keywords: *middle age, Italy, horseback riding, interpersonal violence, palaeopathology.*

During the excavation campaign carried out in 2011 and 2012, a monumental burial was found in the Baptistery of the Cathedral of Padua. The tomb held the remains of about 20 individuals (including adults, infants and fetuses) buried in different times and radiocarbon dated to XI century A.D.

Due to the privileged location of the tomb it is reasonable to assume that the people who were buried in it belonged to one of the elite families of the city.

At a preliminary palaeopathological investigations the skeletons show a fairly good dental health, degenerative joint disease affecting elderly subjects involving especially the vertebral columns and a case of concha bullosa resulting in probable recurrent sinusitis.

Injuries due to interpersonal violence are not uncommon and are observable on four subjects. In one case a lethal wound involving an adult mature woman consisting in an iron arrowhead still embedded on the ribs of the thoracic cage was found. Further, three male skeletons show evidence of healed inflicted traumas. In one case a healed sword cut located on the top of the skull is observable, while the others two cases consist of a healed blow located on the left zygomatic bone (what age was this male?), and a left humeral shaft fracture involving a young male also possibly due to a direct blow.

Moreover, all the male individuals of the skeletal sample show, marked musculoskeletal stress markers on the femurs such as Poirier's facets, medial rotation of the lesser trochanter, hypertrophic linea aspera and bone spurs at the trochanteric fossa probably related to habitual riding practice.

In conclusion, the palaeopathological investigation on the skeletons from this tomb testify for the dangerous way of life of social elites in Italy during the middle age.

Feldman M.¹, Arbesfeld R.¹, Hershkovitz I.¹, May H.¹, Sella-Tunis T.¹, Abramov J.¹, Pap I.³ and Sklan E.²

¹Department of Anatomy and Anthropology, Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel.

²Department of Human Microbiology, Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel.

³Department of Anthropology, Hungarian Natural History Museum, Budapest, Hungary.

Podium

Isolation and characterization of viral nucleic acid sequences from ancient, human naturally mummified soft tissue

Keywords: *Ancient DNA, mummified tissue, viral disease, Retroviruses, viral evolution.*

Viral infections are and were top causes of global morbidity and mortality in present and past populations. As most viral diseases, however, leave no traces in the bones, all is known of their impact on past populations' health comes from written documents. Efforts to extract viral DNA from mummified tissue were only partially successful.

The goal of this study is the isolation and characterization of ancient viral nucleic acid sequences from naturally mummified human tissue to genetically study the evolutionary history of viruses and viral diseases.

The study is based on 18th century mummies that were found in sealed crypts in the Dominican church in Vác, Hungary and were naturally preserved due to a combination of suitable climate conditions. Their internal organs were sampled for DNA analysis. The DNA was purified using silica-based purification methods and was amplified using Polymerase Chain Reaction (PCR) with primers designed to amplify viral DNA sequences, retroviral sequences and members of the hepatitis viral group in particular.

Nucleic acid retrieval from ancient mummified tissue is considered difficult and challenging. This is mainly due to degradation over time and the risk of contamination of the samples by external DNA. To prevent contamination special measures are taken and strict working conditions are maintained. PCR is designed to amplify the small amount of intact DNA sequences found in ancient samples.

While many studies have been dealing with ancient DNA of pathogens such as bacteria, viral diseases have been largely neglected due to the great obstacles in retrieving their genomic material. Despite the difficulties, there is evidence to suggest that this is feasible and can provide valuable knowledge.

Acknowledgment: We thank the Dan David Foundation and Tassia and Dr. Joseph Meychan Chair for the History and Philosophy of Medicine for their

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financial support.

Fibiger L.

School of History, Classics & Archaeology, University of Edinburgh, UK.

Podium

Women and children first: Violence and division of labour in Neolithic Europe

Keywords: *Neolithic Europe, violence, cranial trauma, sexual division of labour, childhood.*

This presentation will examine age and sex differences in the evidence for physical violence in Neolithic Europe, questioning the idea of males as the principle victims of fatal violent interaction in inter- and intra-group conflicts. Cranial trauma patterns in a skeletal sample of over 1000 individuals from Neolithic Europe establish adult men as the main instigators of violent interaction, while it is women and children who most frequently suffered its fatal consequences. Injury patterns confirm that women were in strategically and/or physically disadvantaged positions during violent interactions in the Neolithic, with raids and surprise attacks the most likely context for injuries sustained. Injury prevalence for children peaks in the 8-12 year-olds. This age-group probably represents a transitional life-stage, with increasing involvement in 'adult' activities such as interpersonal violence. Sexual and age-related division of labour appear to equally underpin the practice and experience of physical violence, providing new insights into concepts of gendered division of labour as well as childhood and learning during the Neolithic.

This research was supported by a Wenner-Gren Foundation Hunt Postdoctoral Fellowship (Grant No. 8202).

Fontaine V.¹, Dinarès R.², Baxarias J.¹, Campillo D.¹, Pujol M.¹ and Del Peral N.²

¹Anthropologists and Paleopathologists M.D, Laboratori de Paleopatologia del Museu, Arqueològic de Catalunya, Barcelona, Spain.

²Radiologist M.D, Departament de diagnostic per la Imatge, Capio Hospital General de Catalunya, Barcelona, Spain.

Poster

Four Skulls with Mortal Injuries from Talamanca's Cemetery, (Spain): Problems with Posterior Anthropic Manipulations

Keywords: *Talamanca, skulls injuries, anthropic manipulation.*

During a renovation of the church front door of Talamanca (Catalonia, Spain) in the approximately a hundred of skeletons were found. Some eyes witnesses said that they were quickly removed to a pit inside the cemetery without study.

Last year, an excavation inside the cemetery was organized by our team to find them.

In a hole of 2,50 m by 3 m, we found around 100 skeletons all upside down and disarticulated and 2 huge bags containing also pieces of skeletons all mixed.

We established three different zones and finally the pit itself.

We collected a bone sample in each zone to analyse via ¹⁴C. The results indicated a large range of 600 years.

We found four skulls presenting serious mortal injuries that are the presented here. The Scan and X rays images confirmed peri-mortem injuries.

We explored various explanations for the patterns of trauma and also considered the nature of post-mortem anthropogenic manipulation.

Fornaciari G.¹, Giuffra V.¹, Minozzi S.¹, Calcagnile L.² and Fabbri P.F.³

¹Division of Paleopathology, History of Medicine and Bioethics, Department of Oncology, Transplants and Advanced Technologies in Medicine, University of Pisa, Italy.

²CEDAD, University of Salento, Cittadella della Ricerca di Brindisi, Mesagne (BR), Italy.

³Department of Cultural Heritage, University of Salento, Italy.

Podium

Pre-Columbian Treponematosi from Roca Vecchia (Lecce, Italy)

Keywords: *syphilis, ¹⁴C dating, Southern Italy.*

The origins and antiquity of syphilis are widely debated issues in the history of medicine. Two main hypotheses are accepted: the "Columbian theory" asserts that treponemal disease originated in the New World and was transmitted by Columbus's crew to Europe in the 1490s; the "pre-Columbian theory" claims that the disease was present in the Old World before the discovery of America. Paleopathology can be decisive to solve the question. During the archaeological excavations carried out at Roca Vecchia (southern Italy) the skeleton of an adult male with multiple skeletal lesions was brought to light. Macroscopic, radiological and histological study suggested a diagnosis of treponemal disease. ¹⁴C dating performed on bone collagen with calibration of the marine "reservoir

effects” made it possible to date it with certainty to the pre-Columbian period (1410 – 1450 AD). The case of Roca Vecchia represents the first well-documented and correctly dated evidence of treponemal disease in the pre-Columbian Old World, demonstrating that a form of severe treponematosis with bone lesions similar to venereal syphilis was present in Europe before contact with the American populations and before the epidemic outbreak signalled by documentary sources in 1494.

Fox S.C.

Wiener Laboratory, American School of Classical Studies at Athens.

Poster

Burial, social identity and trauma at Tell Nader, Iraq

Keywords: *Ubaid, marginalized burial, cranial trauma, social outcast, head-shaping.*

Social prescriptions about burial can dictate choices made after death that can be revealed through archaeology. Contextual study of human remains through bioarchaeological analysis can help shed light on these cultural choices that may be linked to social identity. In 2011, the University of Athens’ first field season was undertaken in the Kurdistan region of northern Iraq, at the site of Tell Nader. An adult female skeleton was revealed from a primary inhumation burial recovered from a disused kiln that may date to the Ubaid period. The body had been interred in a prone position with both arms and legs flexed. No grave goods accompanied the burial with the possible exception of three dog teeth. Marginalized in death, it is posited that this woman was a social outcast. Study of the human remains indicate signs of stress early in life in the form of dental enamel hypoplasias, head-shaping of a type common for the Ubaid, and a paleopathological lesion on the right parietal bone of her cranial vault demonstrating a healed depressed fracture from blunt force trauma perhaps produced by a clay shot from a slingshot. Although brain injury cannot be confirmed from this possible evidence for interpersonal violence, this woman could conceivably have exhibited such behavioral changes as headache, seizure disorder, personality change, or memory loss accompanying the cranial trauma. It is suggested that the implications of the cranial trauma in the form of some type of brain injury may have led to this woman’s marginalized burial. Comparisons are made with other sites in and around the region during the Ubaid to help put this social outcast, who had led a challenging existence, in perspective. As in life, death is all about choices.

Fuchs K.¹, Berezina N.² and Gresky J.³

¹Institute for Pre- and Protohistory, Christian-Albrechts-University Kiel, Germany.

²MSU Scientific Research Institute and Museum of Anthropology, Moscow, Russia.

³German Archaeological Institute, Berlin, Germany.

Poster

Juvenile Scurvy in two Bronze Age Caucasian Sites

Keywords: *Scurvy, porous changes, juveniles, North Caucasus, Bronze Age.*

Two cases of juvenile scurvy occur in two Bronze Age populations from proximal geographical regions in the piedmont area of the Northern Caucasus.

The first skeleton is a 15-16 year old boy from the site Marinskaya-5, Kurgan 1, Burial 17, located in the Stavropol region, Russia. The burial dates to the Middle Bronze Age (2700-2600 BC) and belongs to the North Caucasian Culture. The skeleton is almost complete and very well preserved. Abnormal porosity is visible on different areas of the skull, being especially pronounced at the mandibles, the Linea temporalis, the greater wing of the sphenoid, both zygomatic bones, the orbital floor and roof, and the hard palate, in the region of alveolae of maxilla and mandible. Lesser porosities occur in the nasal cavity and aperture. The long bones are less affected, with porous surfaces on the ribs, scapulae, femur, and in the region of the muscle attachments of the biceps.

The site Kudachurt 14 is located in the Kabardino-Balkaria Republic, about 60 km distant from Marinskaya-5, and dates from the Middle to Late Bronze Age (North Caucasian Culture). Grave 211 (2000-1900 BC) contained the skeleton of a 13-15 year old child, probably male. This well-preserved skeleton shows changes, likely caused by scurvy, in almost every part of his body. Very thick porous plates cover parts of the occipital, the parietal (especially Linea temporalis), and the temporal, as well as the mandible. Additionally, plate-like, stringy structures are visible on all long bones (most affected are the tibia and femur), ribs and hand bones, whereas the metacarpals show more pathological change than the phalanges.

What is the reason for scurvy in juveniles from half-sedentary populations in the piedmont area? This investigation is the first attempt to gain some information regarding the life conditions of the almost unknown North Caucasian Culture.

Application for the Cockburn Student Award.

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Fujita H.¹, Giannakopoulou N.² and Suzuki T.³

¹Department of Anthropology, Niigata College of Nursing, Japan.

²Department of Epidemiology, Tokyo Metropolitan Institute of Gerontology, Japan.

³National Institute of Longevity Science, National Center for Geriatrics and Gerontology, Japan.

Poster

A case of Klippel-Feil Syndrome in South Korea dated 2100-2000 years ago

Keywords: *Klippel-Feil, South Korea, Sprengel's deformity.*

This report describes a case of multiple vertebral fusion abnormalities considered to be caused by Klippel-Feil syndrome found among skeletal remains excavated from the Nukdo Shell Mound in South Korea. The remains are dated in 2100-2000 B.P. and are presently housed at the Busan National University Museum. The individual is thought to be approximately 18-20 years of age based on the humeral and femoral epiphyseal fusion. The angle of the greater sciatic notch is wide, suggesting a female. Vertebral fusion is expanded on the entire spine: C5-C6, Th1-Th3, Th5-Th7, Th11-Th12, and L2-L5. The overall vertebral bodies are markedly deformed, and the case is type III based on the classification of Feil (1912). Fusion of the transverse processes is observed in almost all the fused vertebral bodies. In addition, there are multiple fusion abnormalities of the costal processes and the origin of the spinous processes. When the inferior surfaces of the lumbar vertebrae were examined, invagination of the vertebral bodies was observed similar to those involved in a giant Schmorl's node. On the right clavicle, the shaft has a more severe posterior curvature while the sternal end is larger compared to that of the left clavicle. Finally, there are abnormal nodules on the inferior surface of the second right costal bone. The above findings indicate that a Sprengel's deformity could be present. In addition, periostitis-like inflammatory lesions are expanding, bilaterally, from the femoral neck to the greater and lesser trochanters. Although various congenital skeletal dysplasias could be associated to the current case, the distribution pattern of the indicators point to a rare case of severe Klippel-Feil syndrome.

Galea J. and Prof. Robson-Brown K.

University of Bristol, UK.

Poster

The microstructure of cribra orbitalia as seen via micro computed tomography (μ CT) in post-medieval skeletons from the Bristol Royal

Infirmary

Keywords: *micro computed tomography, cribra orbitalia, paleohistopathology, microscopy, historical archaeology.*

This study examines the benefits of utilising micro computed tomography (μ CT) scanning to better understand the microstructure of human bone from the Bristol Royal Infirmary (18-19th century) in the United Kingdom. The μ CT scanner at University of Bristol has been utilised in many contexts and has the potential to shed light on bone conditions such as cribra orbitalia. This condition's manifestation is this study's primary concern, but ideally, a better understanding of the internal structure of normal bone compared to the different degrees of cribra orbitalia will illuminate internal architectural changes that will clarify the aetiology. Examining the structure of the trabecular and cortical bone also better demonstrates differences between reported scores (Stuart-Macadam 1991). The CT-analyser software creates reports that quantitatively describe the qualities of bone. Preliminary results do not suggest a correlation between the scoring system and software analysis, though this could be explained by qualitative differences in cribra orbitalia's manifestation. The results and methods will also be compared to paleohistopathological studies to test whether the technology may yield new insight.

Gallien V.^{1,2}, Darton Y.¹ and Buchet L.¹

¹INRAP, Le Mans.

²CEPAM-CNRS, Nice Sophia-Antipolis.

Podium

Numerous cases of hip dysplasia in a population of VIIth century (Chéméré, West of France)

Keywords: *hip dysplasia, laxity, genetic predisposition, Merovingian, the West of France.*

The medieval cemetery of Chéméré (South of Nantes, France) extended 7 700 m². Excavation of 20% of the complete surface has yielded 416 graves since the 1960's. Considering its organisation, its topography and the nature of the exhumed population, the cemetery is interpreted as belonging to the early Middle Ages.

The 2008 latest excavations allowed study of 181 people. Out of the 92 adults whose pelvis was preserved, 25 (18 males, 7 females) presented signs of abnormal hips that correspond to hip dysplasia.

The sample, representative of a place and an age, is interesting for two reasons: epidemiological and descriptive. On the one hand it presents the two

anatomo-clinical forms of dysplasia that have a distinct evolutionary process but a common genetic substratum: The dislocations and subluxations associated with a mechanical maternal-fetal conflict and dysplasia with no dislocation, the most common ones, causing osteoarthritis complications and labral lesions. On the other hand it gives the opportunity to refine some semiotic aspects (concerning the superolateral labrum and the fovea) characterizing early stages of hip dysplasia. The diagnosis for minor distortions is currently possible on soft parts during infancy (Dunn 1976). At the adult age, the diagnosis is taken into account only when osteoarthritis is developing. This means that the paleopathologist has few anatomic references (Mitchell, Redfern 2011) and that hip dysplasia can only be studied at the stage of subluxation or osteoarthritis. The present sample covers the early stages in this developmental condition.

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Garot E.¹, Beauval C.² and Rouas P.^{1,3}

¹Bordeaux Segalen University (France).

²Archéosphère.

³Bordeaux 1 University, PACEA, UMR 5199.

Poster

Means of distinction between taphonomic and pathologic processes in the case of molar-incisor hypomineralisation

Keywords: *molar-incisor hypomineralisation, MIH, taphonomy, pathology, teeth.*

Molar-incisor hypomineralisation (MIH) is a qualitative anomaly of the dental enamel structure that affects at least one of the first permanent molars and that can be combined with lesions of the permanent incisors. The criteria of clinical diagnosis of this affection were established in 2003 by consensus. However, cases comparable to this anomaly were published as soon as the 60's-70's. Given the relatively high prevalence (3-25% among the living), the quick and extensive tissue decay that is engendered and the complex dental care of these cases, MIH constitute, nowadays, a significant public health issue. Now, no detection, no prevention are possible because the etiology is not elucidated.

Identifying these MIH among ancient populations could eliminate some current etiological hypotheses (environmental pollution due to dioxins, the use of some families of antibiotics...) and would bring essential answers.

We studied an archaeological population (Sains-en-Gohelle, Pas de Calais, France), dating from the seventh to the seventeenth centuries. Defects that are similar to those found in MIH were observed among some specimens. However, before concluding that this anomaly is present in "ancient" populations it seemed necessary to us to eliminate possible taphonomic biases.

Based on a systematic review of the literature, the aim of this presentation is to sum up the means of study (X-ray microanalysis, secondary ion mass spectroscopy, scanning electron micrograph...) that could enable us to make a distinction between these marks of taphonomic process and pathologic marks, in other words, between antemortem and postmortem stains of the dental tissues.

Gernay M.

Durham University.

Poster

Stature and dental enamel hypoplasia in Late Medieval urban North-West Europe

Keywords: *Dental enamel defects, stunting.*

Towns and cities developed rapidly throughout Europe in the Medieval Period. As the urban infrastructure was often inadequate to support the large volume of people, health was often compromised. This paper aims to discuss stature and dental enamel hypoplasia frequency as general indicators of stress and overall health in three urban centres: Caen (France), Ghent (Belgium) and Canterbury (England). The proportion of teeth affected by dental enamel hypoplasia was similar (approximately 14%) for Caen (Saint Pierre de Darnétal) and Ghent (Onze-Lieve-Vrouw Sint Pieter), but much higher (21.4%) for Canterbury (Saint Gregory's Priory). The distribution of severity of dental enamel hypoplasia varies between the tooth types and sites. The average height for males was similar for Caen and Canterbury, with the Ghent males taller. A larger difference was found between the females, with women in Ghent being the tallest and in Caen the smallest.

Giannakopoulou N.

Department of Epidemiology, Tokyo Metropolitan Institute of

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Gerontology, Japan.

Poster

Urbanization and activity patterns during the 17th and 19th centuries in Japan

Keywords: *Urbanization, Edo period, Degenerative Joint Disease, Japan.*

The Edo period (17th to the 19th century) has been a landmark era within the early modern Japanese timeline. At a time when the Western World was already experiencing the benefits and remarkable achievements that industrialization brought along, Japan was coming out of a prolonged period of feudalism, entering a new age of extensive socioeconomic transformation. The rise of urban centers of strong administrative power and the increase of productivity resulting in the development of large-scale nationwide commerce, are only some of the factors, which had an immediate impact on the lifestyle, activity patterns and standard of living of the Japanese populations.

In the current study, a random sample (n=267) of two urban and four smaller, rural, adult Japanese populations, originating in the Kanto region, were examined for the prevalence of degenerative joint diseases, in an attempt to understand the influence and level of impact the aforementioned socioeconomic changes had on the health and activity patterns of the general population. The results indicated that medium-level DJD appeared to be in high levels in both urban and rural environments for all major joints. However, although rural populations exhibited a uniform and bilateral distribution of DJD on the skeleton, the urban populations differentiated in terms of element and side affected between sexes and age groups, with significant differences among middle aged urban individuals. Urban males were affected on both the upper and lower skeleton and especially on the right joints, while urban females had higher frequencies on the lower joints bilaterally, with the hip and ankle being most frequently affected. Historical data also verify the above results and the emergence of a sexual oriented division of labor that is going to grow more distinct during the later half of the 19th century.

Giuffra V.¹, Bianucci R.^{1,2}, Milanese M.³ and Fornaciari G.¹

¹Division of Paleopathology, History of Medicine and Bioethics, Department of Oncology, Transplants and Advanced Technologies in Medicine, University of Pisa, Italy.

²Laboratory of Criminalistic Sciences, Department of Anatomy, Pharmacology and Legal Medicine, University of Turin, Italy.

³Department of History, University of Sassari, Italy.

Poster

Life on Shipboard: Activity-Induced Musculoskeletal Stress Markers of a Sailor from 16th Century Alghero (Sardinia, Italy)

Keywords: *osteoarthritis, enthesopathies, osteochondritis dissecans, stress fracture.*

Archaeological excavations carried out in Alghero (Sardinia) brought to light a mass burial dated back to the second half of the 16th century, referred to the plague epidemic of 1582-1583. Among the plague victims the skeleton of a male aged 35-40 years showed a very peculiar pattern of occupational stress markers.

The spine, shoulder and knee joints are affected by severe osteoarthritis with porosity of the articular surface, osteophytosis and eburnation; the heads of the first and especially third metacarpals, and first and third phalanges of the thumbs show severe osteoarthritic changes as well. Observation of the insertion sites of ligaments and tendons revealed enthesopathies in the scapulae, humeri, ulnae, hand bones, coxal bones, femurs, tibiae and calcanei. Osteochondritis dissecans occurred in several districts, including the left lunate, distal epiphysis of both tibiae and of right fibula, proximal epiphysis of the first right metatarsal and first left cuneiform. Schmorl's nodes affected the thoracic and lumbar vertebrae. Finally, bilateral subacromial impingement syndrome and tuberosity avulsion fracture of the fifth metatarsal were diagnosed.

In conclusion, the presence in this individual of degenerative joint disease, enthesopathies, osteochondritis dissecans, Schmorl's nodes and stress fractures indicate a peculiar, intense and demanding physical activity since a young age. Examination of stress marker distribution and analysis of historical sources about specific occupations in 16th century Alghero harbour suggest that this pattern of skeletal changes is compatible with the lifestyle of a sailor, with an intense oar activity.

Giuffra V.¹, Vitiello A. and Fornaciari G.¹

¹Division of Paleopathology, History of Medicine and Bioethics, Department of Oncology, Transplants and Advanced Technologies in Medicine, University of Pisa, Italy.

Poster

Evidence of Rickets in the Medici Children (Florence, 16th– 17th Centuries)

Keywords: *diffuse cortical porosity, vitamin D deficiency, Renaissance, Florence, Medici.*

Exploration of the Medici Chapels in the Basilica of San Lorenzo in Florence revealed the burials of

nine infantile members of the Medici family. The children's skeletal ages range from newborn to 5-year-olds, showing a series of bone abnormalities, leading to a presumably common origin of these pathological lesions. In particular, diffused cortical porosity, observed on the skull, orbital roofs, costochondral ribs and growth plates between metaphyses and epiphyses, enlarged metaphyses and sternal rib ends, as well as long bone bending, were observed. These lesions are interpreted as rickets. The diagnosis of a metabolic disease linked to vitamin D deficiency should appear unexpected for children who grew up at the court of a Renaissance elite class family like the Medici of Florence. Analysis of the historical and social background is particularly helpful to understand the causes for the onset of such a disease in this aristocratic group. Documentary sources, supported by ^{13}C and ^{15}N bone collagen analysis, attest that weaning of these children took place around 2 years of age. With such prolonged breast-feeding, vitamin D deficiency is expected to rise considerably, in particular if the other main risk factor, inadequate sunlight exposition, is associated with this human milk-based diet.

Grauer A.

Department of Anthropology, Loyola University of Chicago, Chicago.

Plenary lecture

Paleopathology: The Crossroads of Many Disciplines.

For decades, the study of paleopathology has been informed by and deeply intertwined with the field of archaeology. Archaeological investigations have provided paleopathologists with a broader context within which to study the antiquity of diseases, potential etiologies, and social contexts. However, archaeology has also made an impact on the theoretical premises we use to reconstruct the past; providing us with multiple lenses through which we interpret our data. When we broaden our scope further, it is evident that other fields within the social sciences and humanities, including anthropology, history, philosophy, sociology, women and gender studies (to name a few), have much to offer paleopathology. Informed by these diverse disciplines, the field of paleopathology is poised to travel in exciting new directions and along the way will provide these diverse fields with new data and insights into the past.

Guijón Botella H.¹, del Carmen del Arco Aguilar M.², Martín Oval M.³, del Arco Aguilar M.⁴, Rodríguez Martín C.³, Jaeger L.H.⁵ and Mayo Iñiguez A.⁵

¹Department of Parasitology, University of Granada, Granada,

Spain.

²Department of Prehistory, Anthropology and Ancient History, University of La Laguna, Canary Island, Spain.

³Canarian Institute of Bioanthropology, OAMC, Cabildo de Tenerife, Canary Island, Spain.

⁴Museum of Archaeology of Tenerife, Organismo Autónomo de Museos y Centros, Cabildo de Tenerife, Canary Island, Spain.

⁵Laboratory of Molecular Genetic of Microorganisms, Oswaldo Cruz Institute, Oswaldo Cruz Foundation, Rio de Janeiro, Brazil.

Poster

Human coprolites from Guanches mummies, Canary Islands, Spain: Paleoparasitological and Paleogenetic Analysis

Keywords: *paleoparasitology, paleogenetic, ancient DNA, Guanches, coprolites.*

The Guanches, the ancient inhabitants of the Canary Islands, Spain, practiced the mummification process of their dead, through embalming techniques similar to those performed in other ancient civilizations. Especially the method used by the aborigines of the island of Tenerife was more accurate, as demonstrated by excellent preservation their mummies. In this study a paleoparasitological and paleogenetic analysis was conducted on human coprolite samples from Tenerife mummified corpses belonged to the Guanche Culture (AD 1160, Cal BP 790). The Guanches coprolites samples were collected from the Museum of Nature and Man collection (Museo de la Naturaleza y el Hombre), Santa Cruz de Tenerife, Canary Islands, Spain, following paleogenetic measurements. Coprolite and sediment samples (N=24) were removed of abdominal region or sacral foramina of individuals. The samples were rehydrated in 0.5% trisodium phosphate solution during 72h at 4°C. The paleoparasitological investigation was conducted by spontaneous sedimentation, previous to microscopic analysis. The results revealed that individuals were infected by intestinal helminthes since *Trichuris* sp. and *Ascaris* sp. eggs were observed. Additional, several mites were also recovered. All eggs found were measured and photographed and the coprolite sediment separated for paleogenetic analysis. Paleogenetic analysis was conducted by PCR and ancient DNA hybridization with *Trichuris* sp. ribosomal DNA and *Ascaris* sp. mitochondrial DNA molecular targets. Additionally, the ancestry of individuals was accessed by human mtDNA analysis of hypervariable segment I polymorphisms. The results of paleogenetic analysis demonstrated *Ascaris* sp. infection using different mtDNA molecular targets. The study contributes to our knowledge of the living conditions of the Tenerife's ancient population.

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Haeusler M.^{1,2,3}, Schiess R.² and Boeni T.^{1,3}

¹Centre for Evolutionary Medicine, Institute of Anatomy, University of Zuerich, Winterthurerstrasse 190, 8057 Zuerich, Switzerland

²Anthropological Institute and Museum, University of Zuerich, Winterthurerstrasse 190, 8057 Zuerich, Switzerland

³Orthopaedische Universitaetsklinik Balgrist, Forchstrasse 340, 8008 Zuerich, Switzerland.

Podium

Facet joint subluxation indicating possible disc herniation in juvenile *Homo erectus* skeleton

Keywords: *palaeopathology, vertebral column, low back pain, lumbar disc herniation, early hominids.*

Lumbar disc disease is very common in humans. Nevertheless, its etiology is largely unknown. Major risk factors include genetic predisposition and age, whereas the contribution of exposure to occupational physical loading is less clear. The impact of biomechanical stress associated with everyday activity and upright posture and locomotion is, however, difficult to assess. Here, we examine the vertebral column of a 1.5 million year old *Homo erectus* boy skeleton from Nariokotome, Kenya (KNM-WT 15000). Our analysis of this remarkably complete, 8 to 9-year-old fossil hominid suggests the earliest case of juvenile disc herniation. We base this on the finding of facet joint subluxation, which is indicated by an anterior curved remodelling of the left superior articular process of L5 and formation of a nearthrosis at the underside of the left pedicle of L4. The extensive bony changes suggest that the Nariokotome boy suffered several months before his death from recurrent disabling backache and sciatica. This lends support to other indications of advanced social care in early *Homo*, such as the implications of a toothless skull from the slightly earlier site of Dmanisi. In contrast to adults, disc lesions in children and adolescents are often associated with high mechanical loading or trauma. Our finding could therefore suggest that the lifestyle of *Homo erectus* was physically very demanding and /or their vertebral column was not as adapted to bipedal locomotion as that of modern humans.

Hajdu T.¹, Donoghue H.D.^{2,3}, Bernert Z.⁴, Fóthi E.⁴, Kővári I.⁵ and Marcsik A.⁶

¹Department of Biological Anthropology, Institute of Biology, Faculty of Science, Eötvös Loránd University, Pázmány Péter sétány 1/C, H-1117 Budapest, Hungary.

²Centre for Clinical Microbiology (M9), Royal Free Campus, University College London, London, UK.

³Centre for the History of Medicine, University College London, London, UK.

⁴Department of Anthropology, Hungarian Natural History

Museum, Ludovika tér 2, H-1083 Budapest, Hungary.

⁵Department of Archaeology, Herman Ottó Museum, Görgey Artúr str. 28, H-3529 Miskolc, Hungary.

⁶Retired associate professor, University of Szeged, Mályva utca 23, H-6771 Szeged, Hungary.

Poster

Spinal tuberculosis from the Middle Ages in Transylvania (Romania)

Keywords: *ancient mycobacterial DNA, osteoarcheological material, PCR, skeletal tuberculosis, Transylvania (Romania).*

Tuberculosis (TB) is an infectious disease prevalent in both present and ancient human populations. It is not possible to accurately assess the frequency of TB infection based on the paleopathology of ancient skeletal remains alone, because the bones are affected in only 5-6% of tuberculosis infections. Furthermore, the taphonomic processes in the soil can also influence the visual appearance of the human skeletal remains. However, it is important to determine the incidence of ancient TB in the bones, because this can provide important data on the medical history and evolution of *Mycobacterium tuberculosis* and gives a unique opportunity for physicians to observe the course of bone TB infection in the pre-antibiotic era.

A human osteoarchaeological collection (n=274) from the 12th-13th century Transylvanian archaeological site of Peteni, served as a source of material. The skeleton of a 45-50-year-old male from Transylvania, in modern-day Romania, provided an opportunity for the direct observation of tuberculous spondylitis. This particular case of spinal tuberculosis was presented briefly - with many other ancient Hungarian TB cases - at the 2008 PPA Meeting in Copenhagen. The authors now present the case in more detail, in particular, by including the molecular analysis alongside the gross morphology.

Rib fragments were used for DNA extraction. Approximately 60 mg of bone powder was examined and DNA from the *M. tuberculosis* complex was detected by PCR targetting specific regions of the IS6110 and IS1081 regions. Therefore, the DNA analysis supports the morphological diagnosis. Based on this particular case, we can conclude that TB was present in Transylvania (Romania) during the 12th-13th century.

Herrerín J.¹, Sánchez M.A.², Onstein S.³, Reckard V. and Warkentin E.

¹Universidad Autónoma de Madrid, Spain.

²Englewood Hospital NJ and Mount Sinai School of Medicine NY

USA.

³University of Memphis, Tennessee, USA..

Podium

Mummification practices on human remains found at the tomb of Panhesi (TT16): post mortem surgery and prosthesis for the after life

Keywords: *Egyptian mummification, 19th dynasty, TT16 Paneshi, Post-Mortem Surgery, Rameside techniques.*

The Rameside tomb of Panhesi (TT 16) is located in Dra Abu El-Naga (Luxor West Bank), consists of two decorated rooms and a passage of 50 meters towards the burial shaft of the original owners. Abundant human remains were found in this passage. The condition of the remains can best be described as precarious, some skeletonized, the majority mummified. These remains are the consequence of the continuous reuse of the tomb for intrusion burials for over 1000 years of the more than 2000 years of the tomb's history.

During the 2011 season, the first 7 meters of the passage yielded a great quantity of remains, mostly human, and in December 2011 and January of 2012, anthropologic and paleopathologic studies were performed. Besides the paleopathologic findings, researchers found it striking that numerous mummies had post mortem procedures designed to repair pathologic conditions and/or cosmetic defects to improve the appearance of the deceased for eternity. Thus, our title: «Post Mortem Surgery and Prosthesis for the After Life».

We will present our initial conclusions on the repair techniques in the mummification process. This project will be continued during the next several seasons with the hope of adding additional findings to our preliminary analysis.

Hershkovitz I.^{1*}, Spigelman M.¹, Do-Sun Lim², In Sun Lee³, Chang Seok Oh^{4,5}, May H.¹, Boaretto E.⁷, Yi-Suk Kim⁸, Soong Deok Lee^{5,6}, Peled N.⁹, Myeung Ju Kim¹⁰, Toledano T.¹¹, Bar-Gal G.-K.¹² and Dong Hoon Shin^{4,5*}

¹Dept of Anatomy and Anthropology, Sackler Faculty of Medicine, Tel Aviv University, Israel.

²Dept of Dental Hygiene, Eulji University, Korea.

³Dept of Diagnostic Radiology, Seoul National University College of Medicine, Korea.

⁴Dept of Anatomy, Seoul National University College of Medicine, Korea.

⁵Institute of Forensic Medicine, Seoul National University College of Medicine, Korea.

⁶Dept of Forensic Medicine, Seoul National University College of Medicine, Korea.

⁷Weizmann Institute of Science, Israel.

⁸Dept of Anatomy, Ewha Womans University School of Medicine, Korea.

⁹Dept of Radiology, Carmel Medical Center, Haifa, Israel.

¹⁰Dept of Anatomy, Dankook University College of Medicine, Korea.

¹¹Dept of Radiology, Maimonides Medical Center, Brooklyn, NY, USA.

¹²Dept of Virology, Koret School of Veterinary Medicine, Hebrew University of Jerusalem, Israel.

*Israel Hershkovitz and Dong Hoon Shin are the first authors and contributed equally to this work.

Podium

A possible case of Cherubism in a 17th-century Korean female mummy

Cherubism is a benign fibro-osseous disease of childhood limited specifically to the maxilla and mandible. The progressive replacement of the jaw bones with expansile multilocular cystic lesions causes eventual prominence of the lower face, and hence the classic "cherubic" phenotype reflecting variable extents of jaw hypertrophy. Histologically, this condition has been characterized as replacement of the normal bone matrix with multicystic pockets of fibrous stroma and osteoclastic giant cells. Because of radiographic features common to both, primarily the presence of multiloculated lucencies with heterogeneous "ground-glass" sclerosis on CT imaging, cherubism was long mistaken for a craniofacial subtype of fibrous dysplasia. In 1999, however, the distinct genetic basis for cherubism was mapped to chromosome 4p16.3 and the SH-3 binding protein SH3BP2. But while there are already three suspected cases of fibrous dysplasia amongst archaeological populations, no definitive cases of cherubism have yet been reported in historical populations. In the current study we describe micro- and macro-structural changes in the face of a 17th century Joseon Dynasty Korean mummy which may coincide with the clinicopathologic and radiologic features of cherubism.

Hongslo Vala C.¹, Kjellström A.², Vretemark M.³, Sten S.⁴ and Mellström D.⁵

¹Department of Geriatrics, Göteborgsvägen 31, 421 80 Mölndal, K-huset plan 6 Mölndal hospital, Sweden.

²Osteoarchaeological Research Laboratory, Department of Archaeology and Classical Studies, Stockholm University, 106 91, Stockholm, Sweden.

³County Museum of Västergötland, Box 253, S-53223 Skara, Sweden.

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⁴Gotland University, Department of Osteology, Cramérgatan 3, 621 67 Visby, Sweden.

⁵Department of Geriatrics, Göteborgsvägen 31, 421 80 Mölndal, K-huset plan 6 Mölndal hospital, Sweden.

Poster

Osteoporosis and hip fractures in Medieval Sweden

Keywords: *osteoporosis, hip fractures, Varnhem, Sigtuna, Kopparsvik.*

Osteoporosis is a major health problem in society today. Sweden is one of the countries with the highest prevalence of osteoporosis and the country which has the highest prevalence of hip fractures in the world [1].

A preliminary comparative study of osteoporosis among three Swedish early medieval and medieval churchyards (the urban Sigtuna in Uppland, the rural Kopparsvik in Visby on Gotland and the rural Varnhem in Västergötland) was carried out. The material consisted of 196 adult individuals. One femur from each individual was measured in a DXA (dual-energy X-ray absorptiometry) machine. Only well preserved bones were measured.

In the total sample, only one osteoporotic hip fracture was identified, a woman over 40 years of age from Sigtuna. A literary study of Swedish analyzed medieval materials, including more than 3000 individuals, revealed approximately 11 probable cases of osteoporotic fractures [2].

The results from the DXA -measurements of 196 femoras indicate that 10 women had low bone density and that 2 women and one man were affected by osteoporosis. The individuals from Varnhem had the highest DXA-scores, while Sigtuna had the lowest scores.

The differences between the three sites might be explained by the fact that Varnhem was a churchyard for the nobility while the churchyard in Sigtuna was used for people of poor health [3,4]. The people buried in Kopparsvik were farmers. The explanation for the low frequency of osteoporotic hip fractures from the medieval societies in Sweden could be that the life expectancy was low; hip fractures today usually occur after 80 years of age [1]. Alternative or additional explanations could be that the hip geometry, gene composition, and physical behavior differed from today.

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Huchet J.-B.

UMR 5199 / CNRS – PACEA, Laboratory of Anthropology (A3P). University of Bordeaux I. Bât. B 8, Avenue des Facultés 33405 Talence Cedex – France.

UMR 7209 / CNRS – Archaeozoology, Archaeobotany. National Museum of Natural History. CP 56, 55 rue Buffon, F-75005 Paris.

UMR 7205 / CNRS. Department of Systematics and Evolution (Entomology). National Museum of Natural History, 45 rue Buffon, F-75005 Paris.

Podium

Insect artifacts on Human bones in archaeological contexts: Osteophagy vs paleopathology

Keywords: *insect damage, bone modification, taphonomy, pseudopathology, ichnology.*

Different taxa of arthropods play a significant role in the taphonomic processes of bone degradation. Their damage, relatively well-studied for the Jurassic or Cretaceous Sauropod bones, remains poorly documented for human remains. In archaeological contexts, the more frequently encountered traces on bones could be attributed to five main orders of insects: Isoptera (subterranean termites), Coleoptera (notably the genus *Dermestes* Linnaeus), Hymenoptera (wasps and wild bees), Diptera (true flies) and lastly Lepidoptera (keratinophagous moths belonging to the genus *Ceratophaga* Petersen). The damage due to these arthropods, frequently spectacular, could be sometimes misinterpreted as pathological lesions or even be linked with some specific anthropic interventions.

From different geographical, chronological or cultural archaeological contexts we will illustrate how these «traces» could provide relevant data in the knowledge of palaeoenvironments as well as in our understanding of some ancient funerary practices.

Iwanek B. and Piontek J.

Adam Mickiewicz University in Poznan, Faculty of Biology,
Institute of Anthropology, Department of Human Evolutionary
Biology, Umultowska 89, 61-614 Poznan, Poland.

Poster

Environmental stress in the medieval West Slavic population of Cedynia (Poland)

Keywords: *environmental stress, MOS, MSM, Western Slavs, Middle Ages.*

The aim of this study is to describe and analyze the incidence of various skeletal indicators of environmental stress in the medieval population of the Western Slavs, that used the cemetery of Cedynia (Poland).

The cemetery is located in the northern part of the present city of Cedynia (52°53' N, 14°12' E). It was used in two phases. The first phase lasted from the first half of the twelfth century to about the middle of the thirteenth century. The second phase, with similar funerary rite, lasted from about the middle of the thirteenth century to the mid-fourteenth century.

The study embraced more than 100 skeletons of children and more than 300 skeletons of adults – males and females. The analysis included the incidence of cribra orbitalia, Harris lines, enamel hypoplasia, occupational stress markers (MOS), musculoskeletal stress markers (MSM), injuries and fractures, degenerative changes of the spine and joints, dental diseases, and sexual dimorphism.

Some of the data used in this work come from the authors' own research, and some - from published papers, mostly originated in the Institute of Anthropology, Adam Mickiewicz University in Poznan. To evaluate the level of expression of the examined traits and to describe the severity of skeletal stress indicators widely accepted classification systems and standards were used.

The presented results may be treated as reference data for the studies of skeletal indicators of environmental stress in medieval Slavic populations, since they were collected on a large set of very well-preserved skeletons.

The paper also describes the effects of environmental stress on the morphology of individuals (body size and body shape) and the demographic structure of the population (mortality structure, potential reproductive success).

Jaeger L.H.¹, Dias Neto O.², Mayo Iñiguez A.¹

¹Laboratory of Molecular Genetic of Microorganisms, Oswaldo Cruz Institute, Oswaldo Cruz Foundation, Rio de Janeiro, Brazil.

²Brazilian Archaeology Institute Belford Roxo, Rio de Janeiro,

Brazil.

Podium

Paleogenetic and Paleoparasitological analysis of 17th-19th century human remains from Rio de Janeiro, Brazil

Keywords: *paleoparasitology, paleogenetic, ancient DNA, intestinal helminths, human mtDNA.*

The Rio de Janeiro city was the capital and main commercial center of Brazil during the colonial period and as a consequence experienced massive urbanization. Paleoparasitological and paleogenetic analysis was conducted on human sediment samples from the archaeological sites of Nossa Senhora do Carmo church (NSC) and Praça XV cemetery (PXV) from Rio de Janeiro, Brazil, dating from the historic period (17th-19th century). The NSC samples were collected from the archaeological site through strict paleogenetic conditions and submitted to ancient DNA (aDNA) extraction. PXV samples are stored in the Institute of Brazilian Archaeology collection and were collected following paleogenetic measurements. PXV samples were in a good state of preservation, with evidence of washing and brushing, as opposed to NSC material. Sediment samples were removed of sacral foramina from 28 individuals. The sediments, constituted mainly of sand, were rehydrated in 0.5% trisodium phosphate solution during 72h at 4°C. The paleoparasitological investigation was conducted by spontaneous sedimentation, fluctuation with Sucrose and flotation with Zinc chloride, and then microscopic analysis. Paleoparasitologic analysis showed that 4/18 and 9/10 individuals from NSC and PXV, respectively, were infected by intestinal helminths and/or protozoa. All eggs found were measured, photographed and separated for genetic analysis. *Trichuris* sp., *Ascaris* sp. and *Taeniidea* eggs were found in 13 individuals and protozoa cysts were observed in 3 individuals. In order to detect trichuriasis and ascariasis infection, aDNA hybridization with the *Trichuris* sp. rDNA and *Ascaris* sp. mtDNA molecular targets were applied. Additionally, the ancestry of individuals was accessed by human mtDNA analysis of hypervariable segment I polymorphisms. The results of aDNA hybridization from NSC samples demonstrated different levels of infection intensities in 15/18 individuals, using *Ascaris* sp. mtDNA molecular target and 9/18 using *Trichuris* sp. rDNA. The human remains retrieved from the historic archaeological sites constituted an opportunity to study infectious disease during Brazilian colonial period due to the absence of data related to this period, and the good preservation state of material.

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Jakob T.

Department of Archaeology, Durham University, South Road,
Durham DH1 3LE.

Podium

Small Town Life - Health Stress in Post-Medieval Durham, North-East England, U.K.

Keywords: *Metabolic disease, non-specific infectious disease, trauma, dental disease, childhood mortality.*

Archaeological excavation necessitated by the regeneration of Durham Market Place allowed a rare opportunity to study a post-medieval (ca. 18th-19th centuries) skeletal population from the North-East of England. Before the mid-19th century Durham was a town largely bypassed by industrialization and it was hypothesized that its inhabitants were unaffected by metabolic disease and other health stress indicators, unlike contemporary populations from the large industrial centres of Northern England.

A total of 73 articulated human skeletons and a large number of disarticulated human remains associated with the burial ground of St Nicholas' Church were analysed using standard macroscopic techniques and radiography. The minimum number of individuals represented in this population was 174. Childhood mortality was high and many non-adults were small for their biological age, based on age estimations using dental formation and long bone length. The average height for women was 157.02 cm, while male stature was 169.7 cm and both men and women were of slightly below average stature compared to individuals from other post-medieval cemeteries.

Evidence for childhood stress was abundant in form of non-specific infectious disease and many individuals showed enamel defects indicative of childhood disease and/or malnutrition. However, cribra orbitalia indicative of anaemia was rare. Several adults showed possible evidence of healed childhood rickets (vitamin D deficiency) and a number of children presented with typical bowing deformities of the lower leg bones that are associated with rickets. In addition, a wide range of pathological conditions was observed, including dental disease, congenital anomalies, infectious disease, traumatic injuries and joint disease. Written records for post-medieval Durham attest poor and unhygienic living conditions and even in the absence of heavy industry these were likely to have been responsible for many of the pathological lesions found in this population.

Jerszyńska B. and Bokiej E.

Adam Mickiewicz University in Poznan, Faculty of Biology,
Institute of Anthropology, Department of Human Evolutionary

Biology, Umultowska 89, 61-614 Poznan, Poland.

Poster

Anthropological analysis of dental caries intensity in males and females from historical populations from Europe

Keywords: *dental caries, Middle Ages, dental anthropology.*

Teeth play very important role in the research on skeletal samples. Often they are the only well preserved skeletal elements. Observations of dental morphology and lesions are important source of information about age at death, health status and living conditions of past populations.

One of the diseases more often observed on skeletal material is dental caries, which is "a disease process characterized by the focal demineralization of dental hard tissues by organic acids produced by bacterial fermentation of dietary carbohydrates" (Larsen 1982).

The aim of this study was to carry out the anthropological analysis of dental caries in medieval female and male populations from Europe and to compare these medieval samples with those from other historical periods.

The material used in this study consists of data on 49 skeletal series from across Europe (1st – 19th c. AD) mostly deriving from the literature. To check the statistical differences between the populations the Mann-Whitney and Kruskal-Wallis tests were used.

During the Middle Ages the intensity of dental caries amounted 11,3% for females. For males only a little higher value was found – 12%. For women the dental caries intensity increases proportionally to the chronological periods and significant differences were observed between ancient and modern times. For men the intensity increases only from ancient to late medieval and early modern times. The observed differences were not statistically significant.

In the anthropological and medical literature the information about the sex differences in dental caries intensity is limited. All studies indicate that women suffered from dental caries more often than men. This is explained with physiological aspects and behavioral factors (diet). Techniques of food preparation, preferences and eating habits were primarily changing during centuries. Neolithic revolution caused the increase of plant and other sources of sugars consumption, that led to the higher incidence of dental caries.

Jones A.K.G.

York Archaeological Trust, 47 Aldwark, York YO1 7BX, UK.

Podium

Trichurid ova: are they always *Trichuris trichiura*?

Keywords: *parasites, Pompeii, Trichuris sp., whipworm, York.*

This research will review recent finds of trichurid ova from unusual contexts. First intra-mural waste disposal pipes at Pompeii are often lined with white calcareous deposits, and occasionally tufaceous deposits containing parasite have been found. These have been found to contain trichurid parasite ova. Second, late 19th/ early 20th century slop water closets from Hungate, York have been investigated, they too contain trichurid ova. The third case is of a modern turf roof from Cumbria UK where trichurid ova were recovered.

The findings warn against always assuming that trichurid ova found on archaeological sites are *Trichuris trichiura*. Before specific identification is possible, methods of processing samples need to be considered and an assemblage of eggs should be measured and basic statistics calculated.

Justus H.M.^{1,3} and Agnew A.M.^{2,3}

¹JPAC-Central Identification Laboratory, Honolulu, Hawaii, USA.

²Division of Anatomy and ³Department of Anthropology, The Ohio State University, Columbus, Ohio, USA.

Poster

Two Possible Cases of Leprosy in Medieval Poland

Keywords: *leprosy, medieval, Poland.*

Grave 7/02 and a deposit near grave 3/06 of the Giecz Collection (11th - 12th centuries) include foot bones that exhibit possible manifestations of leprosy, a disease rarely reported for medieval Poland (Gładkowska-Rzeczycka 1976). Leprosy is an infectious disease caused by *Mycobacterium leprae*, bacteria that are closely related to that of tuberculosis. Skeletal manifestation of leprosy can include rhinomaxillary syndrome, Charcot's joint, and concentric cortical bone-loss and osteomyelitis in the hands and feet. Neurotrophic manifestations in the hand and foot bones occur in more advanced stages of leprosy, yet are the most common joint lesion reported for this disease (Ortner 2003). It is believed that leprosy was introduced into Europe from Asia (Møller-Christensen 1967), the earliest cases emerging around AD 150 and increasing in prevalence between AD 1000 and AD 1400 (Ortner 2003). Although it was known to flourish in Europe during the Middle Ages (Møller-Christensen

1967), few cases of leprosy from medieval Poland have been reported in the archaeological literature (Gładkowska-Rzeczycka 1976). This presentation describes two possible cases of leprosy observed in the Giecz Collection and offers differential diagnoses. Unfortunately, grave 7/02 does not include facial bones and the deposit near grave 3/06 only includes a fused metatarsal/proximal pedal phalanx. Without facial and hand bones, a definitive diagnosis is not possible.

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Kanz F.¹, Grossschmidt K.² and Risser D.¹

¹Department of Forensic Medicine, Medical University of Vienna.

²Center of Anatomy and Cell-Biology, Medical University of Vienna.

Poster

Medical Treatment or legal punishment? – Limb amputations in Medieval Austria

Keywords: *Medieval, amputation, punitive, medical treatment.*

Osseous evidence for healed amputations of the upper and lower limbs is rare in the medieval archaeological record. Unearthed human remains from two partially excavated Austrian graveyards were subject of this study, representing 186 early medieval individuals from the city of Salzburg and another 1596 from the medieval city of St. Poelten (Lower Austria).

Only three out of all 1782 adult individuals expressed typical signs of limb amputations, two mature males from St. Poelten (STP) and one late adult male from Salzburg (SAL). The state of healing indicates in all cases that the injuries happened years before death.

Individual STP-1621/11 experienced amputations of the left forearm and the right leg, whereby the radius and the ulna have been severed in the middle and the tibia and fibula in the lower third. The irregular ragged appearance of the affected, non-fused, bone ends indicates comminuted fractures as initial incidence causing the amputations. Individual STP-1544/11

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suffered from an amputation of the right forearm close to the wrist well healed but there was no fusion of the ulna and radius. SAL-SK9/03 revealed in Salzburg shows amputation of both forearms close to the wrist without signs of sawing. Both stumps are perfectly healed, forming a bony, stable junction between ulna and radius. This finding indicates a single sharp force trauma in a controlled environment as the initial incident.

In all three cases we could not clearly determine whether legal punishment or an accident followed by medical treatment is due to our findings. However, in the case of STP-1544/11 (St. Poelten) and SAL-SK9/03 (Salzburg) the physical traits are likely to correspond to early medieval legal punishment. STP-1621/11 (St. Poelten) appears to have suffered a multiple trauma followed by medical interventions.

Kaupová S.^{1,2,3}, Herrscher E.¹, Velemínský P.² and Brůžek J.^{3,4}

¹UMR 7269 du CNRS, Laboratoire de Préhistoire Europe Afrique, Aix-Marseille Université, 13094 Aix-en-Provence, France.

²Department of Anthropology, National Museum, Václavské náměstí 68, 11579 Praha 1, Czech Republic.

³Department of Anthropology and Human Genetics, Faculty of Science, Charles University, Viničná 7, 12844 Praha 2, Czech Republic.

⁴PACEA-A3P, UMR 5199, CNRS, Université Bordeaux 1, 33405 Talence, France.

Poster

Infant and young child feeding practices, mortality and health in Great Moravian skeletal sample (9th-10th century, Czech Republic)

Keywords: *breastfeeding and weaning, stable isotopes, morbidity, mortality, Middle-ages.*

The 9th century in the area of Czech Republic is associated with the profound change of society in relation to the Christianization and the formation of the first state structure. In order to define the infant and young child diet in Great Moravian population and its influence on the health, this study aims to analyze osteological and isotopic data of a subadult group aged 0-5 years. To assess whether the type of residence and economic status had an impact on the infant feeding practices, the individuals from the power centre in Mikulčice and from the rural graveyard in Josefov were selected for the study. The mortality and morbidity profiles have been analyzed using stress markers, long bones size and infectious lesions. To understand the infant diet history, stable nitrogen isotopic data were recorded from 41 children from both sites using

an intra-individual sampling strategy (bone versus tooth). The results show a great variability in the age of cessation of breastfeeding. Some infants may have been weaned during their second year of life while some others may have still been consuming a breast milk substantially by the age 4-5. Both these extremes were observed in the urban sample of Mikulčice, which suggests several weaning strategies may have been applied in that population, probably in relation to the socio-economic status. On the other hand data from the rural sample of Josefov show one clear pattern of weaning, with a cessation of breastfeeding after the age of 2. This variability in feeding practices is discussed in relation to the morbidity and mortality profiles in both samples.

Keller C.¹, Klement L.-L.², Weberstorfer M.¹ and Teschler-Nicola M.^{1,3}

¹University of Vienna, Austria.

²University of Mainz, Germany.

³Natural History Museum Vienna, Austria.

Poster

Generalized sclerosis and hyperostosis – a differential diagnostic challenge

Keywords: *sclerosis of the diploe, massive irregular periosteal bone formation, differential diagnosis, modern age, Austria.*

Generalized sclerosis and hyperostosis belongs to a group of developmental diseases that are rarely observed and not well understood; patho-genetically only a few cases were identified. To date, only one case was reported from an archaeological context (Allison et al. 1976; Ortner and Putschar 1982). Here we present a mature male, aged between 40 and 60 years, recovered from a modern-time cemetery (used between 1560 and 1911) at Mautern (Lower Austria). This specimen reveals thickened long bones of the lower extremity with massive irregular new bone formation (periostitis) and a sclerosis of the skull diploe. The bones are 2-3 times heavier than normal.

The preservation status of the skeleton is incomplete (differential diagnostically relevant facial bones are absent, so are vertebrae and phalanges). The remains were investigated macroscopically, by the use of a reflected-light microscope, by x-ray and by thin-ground section technique.

Particularly noticeable is the weight of the skull fragments, obviously caused by a sclerosis of the diploe (there are also some inflammatory changes at the internal layer of the cranial vault). Outstanding is also the increased diameter of the long bones, in particular the tibiae. They show an increased diameter and masses

of irregularly build new bone formations. They were developed bilaterally along the shafts of long bones at both, the upper and lower extremities, especially at the tibiae, radii and ulnae. Metaphyses are not concerned and joint surfaces are intact. Periostitis could also be observed at the scapulae and clavicularae.

These features point to the occurrence of a “generalized hyperostosis and sclerosis” (Adler 2004; Freyschmidt 2007). We document the features in detail and discuss the findings in differential diagnostic respect: a) congenital skeletal changes (including osteopetrosis; Camurati-Engelmann disease; van Buchem disease; M. Paget; cranio-dyaphyseal dysplasia; Pachydermia); b) acquired hyperostotic and sclerotic skeletal changes (including hypertrophic osteoarthropathy).

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Keller C.² and Teschler-Nicola M.^{1,2}

¹Department of Anthropology, Natural History Museum, Vienna.

²Department of Anthropology, University of Vienna.

Poster

The early Bronze Age population Franzhausen I (Lower Austria): Traumata and past grave disturbances – a differential diagnostic challenge

Keywords: *Traumata – fracture pattern - grave disturbances – Bronze Age – Lower Austria.*

The burial ground Franzhausen I in Lower Austria belongs to the most important early Bronze Age sites in Europe. The 714 graves were structured corresponding to burial rites and substantially enriched with grave goods (in particular with wealthy metal objects, Neugebauer 1997). The site was located at a cross point of trading routes, what may lead to the wealth of the population. A significant feature of this burial ground is the extensive disturbance of the graves due to a re-

opening in prehistoric time. This is not an uncommon phenomenon in Lower Austrian early Bronze Age sites (Sprenger 1999, Neugebauer 1997).

This paper focuses on the analysis of perimortal and intra-vital fractures of 325 (sufficiently preserved) individuals to reconstruct the behavior pattern and (probable) interpersonal conflicts and to investigate the possible correlation between fracture-patterns and grave disturbances recorded by the archaeologists.

The remains were studied by using macroscopic and reflected-light microscopical inspections and x-ray analysis. We recorded the preservation status of the skeletons, the type and frequency of intra-vitam, peri-mortem as well as post-mortem induced fractures and checked the findings against the degree of grave disturbances (grade I-V) observed by Neugebauer (1991).

Traumata of intra-vitam origin were identified in about 10% of the individuals; some of them exhibit features of therapeutic intervention, a few represent classical “Parry-Fractures” (Teschler-Nicola 1988). Peri-mortem fractures were found in 25% and post-mortem fractures in 100% of the individuals. These findings were contextualized with the evidences of the type and severity of past grave disturbances. The paper will further address questions regarding the reliability of features used to differentiate between peri- and post-mortem fractures in taphonomically altered skeletal remains.

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University of Sassari, Italy.

University Health Network, Canada.

Poster

Paleopathological assessment of a crypt population during the 17th century to the 19th century

Keywords: *mummification, DNA, paleopathology, pathogens, paleoepidemiology.*

To better define the pathological causes of death during the modern historical period we conducted a paleopathological examination of a crypt (CSD2011AMB3) in the Cathedral Sant'Antonio Abate in Castelsardo, Sardinia, Italy. Interestingly, this crypt has a unique set of environmental conditions that mummified several individuals interred in the crypt. We were therefore able to examine not only well-preserved bone and teeth specimens but also muscle, hair, and skin specimens. Skeletal remains were examined for gross anomalies. Histology was also performed on bone, muscle, and skin specimens. DNA and RNA were extracted from dental pulp and bone, and microarrays were performed as well as sequencing for the identification of *Yersinia pestis* and a variety of other pathogens associated with epidemics during the 17th to the 19th century. To determine epidemics and outbreaks associated with this period, local historical birth and death records were assessed and quantified. Several peaks were identified that corresponded to outbreaks of *Yersinia pestis*, Variola, and possibly other bacterial pathogens. Each individual in the crypt population was further characterized for HLAs (human leukocyte antigens) and mitochondrial sequences using next generation sequencing. A model will be presented relating the population characteristics (genetic and morphological) with the paleopathological findings and the paleoepidemiological findings.

Kelvin N., Campus F.G.R., Demurtas M.A., Sanna L., Viganò C., Marongiu P., Paglietti B., Luccia A., Chessa D., Gallus G., Ponzeletti A., Banner D., Kelvin A., Zarnke A., Leon A., Simbula L., Montella A., Milanese M., Mazzarello V., Rubino S. and Kelvin D.

University of Sassari, Italy.

University Health Network, Canada.

Poster

Bioarcheological and historical analysis of mother-infant-children crypt burials in Castelsardo, Sardinia, Italy (1600-1825)

Keywords: *mother-infant burials, DNA sequencing, ancient pathogens.*

The church of Sant'Antonio Abate in Castelsardo Sardinia, Italy, was constructed in the late 16th to the beginning of the 17th century. Castelsardo held a strategic position in Northern Sardinia throughout the Argonese and Sardinian Kingdoms. Excavation of a Sant'Antonio Abate crypt led to the discovery of the remains of several individuals, interred between 1600 and 1830, who were naturally mummified by the ambient temperature and humidity in the room. Examination of mummified tissues and skeletal remains indicated that the crypt interred male and female adults and children. While the discovery of the mummified remains is extremely useful in the biological analysis of causes of death, one other discovery was equally surprising and intriguing: a wooden coffin belonging to a young woman (hereafter known as Individual 32) who was buried with an infant. This was the only individual in the crypt who was buried in a wooden casket. Furthermore, the placement of the casket was very particular: it was situated in the middle of the crypt, likely indicating a person of importance in the Castelsardo community. Examination of the infant remains suggests the baby was very close to partition. The infant was buried within a special garment. Interestingly several other mother- and infant burials were also noted, including that of infant(s) buried in sughero, traditional tree bark used for making cork, and an infant buried in a locally constructed basket. Ancient DNA sequencing using capture human MHC arrays and next generation sequencing is currently underway to determine the relationship between female skeletal remains and infants. Furthermore, paleoepidemiological analysis reveals that seasonal deaths among children correlated with possible outbreaks of bacterial and viral diseases. This hypothesis is also being tested using capture pathogen arrays and next generation sequencing.

Kharobi A.¹ and Buccellati G.²

¹UMR 5199 - PACEA - Équipe A3P.

²Professor Emeritus, Dept. of Near Eastern Languages and Cultures, UCLA.

Poster

Pathology or Taphonomy? A skeleton from Mozan (Northeastern Syria) dates to the Middle Bronze Age (2000 – 1600 BCE)

Keywords: *Osteomyelitis, Trephination, Taphonomy,*

Rodents, Syria, Middle Bronze Age..

The necropolis of Tell Mozan (Northeastern Syria) has delivered over 150 human skeletons, dating to the Khabur period (Middle Bronze Age 2000 – 1600 BCE).

One skeleton exhibits significant amount of pathological conditions, most predominately osteomyelitis on the right distal femur with reactive new bone growth resulting in an enlarged and deformed appearance. The skull exhibits a grooving at the coronal-sagittal suture junction, which looks like a force trauma. A large circular hole on the posterior side of the same skull was observed, mainly on the right parietal cutting the lambdoidal border of the occipital, and a portion of the left parietal after the sagittal suture. This looks like a very possible case of trephination. But no bone remodeling is present while some sides of this hole show gnawing marks caused probably by animals.

However, the presence of this procedure in the Khabur region remains undocumented, with this being the only case identified at Mozan. Further analysis showed that the presence of rodent activity is well documented in this burial, with several bones showing significant amount of surface area chewed by rodents.

This paper presents firstly, an ancient example of osteomyelitis. Then it seeks to show that the differential diagnosis by observing the lesions of the bones in an isolated way, can lead us to distinguish two major causes: pathology and taphonomy (trauma, trephination, or rodent activity). Finally, it demonstrates that contrary to what was mentioned in some ancient letters and medical texts from Mesopotamia, distancing the sick body from the healthy constituents of society was not a common funerary practice.

Kjellström A.¹, Sten S.², Vretemark M.³ and Hongslö Vala C.⁴

¹Osteoarchaeological Research Laboratory, Department of Archaeology and Classical Studies, Stockholm University, 106 91, Stockholm, Sweden.

²Gotland University, Department of Archaeology and Osteology, Cramérgatan 3, 621 67 Visby, Sweden.

³County Museum of Västergötland, Box 253, S-53223 Skara, Sweden.

⁴Department of Geriatrics, Göteborgsvägen 31, 421 80 Mölndal, K-huset plan 6 Mölndal sjukhus, Sweden.

Poster

A comparative study of osteoarthritis in four Swedish medieval skeletal assemblages

Keywords: *osteoarthritis, Middle ages, Skara,*

Varnhem, Sigtuna, Kopparsvik.

Osteoarthritis (OA) is a major health problem. According to the World Health Organization, OA is predicted to become the fourth leading cause of disability in 2020. In archaeological bones, defining and diagnosing OA has been a topic of debate. There is a call for detailed standardized registries of bone changes present with OA, developed in collaboration with radiologists and clinical specialists.

The main aim with this preliminary study was to test a straightforward macroscopic scoring method and to investigate differences in contemporaneous sites from varying contexts. The study includes skeletons from 332 adult individuals from four Swedish early medieval sites. In each sample, the joint surfaces from six bones per skeleton were visually examined. The presence and degree of eburnation, pitting, marginal osteophytes and intra-articular bone were recorded in quadrants. As a first step of the study, a summative classification was made for each joint. The diagnostic criteria used for OA were eburnation or osteophytes in combination with joint surface pitting. Typical and representative changes were x-rayed, with the frequencies, variation of markers, and degree of OA in relation to sex, age and archaeological site investigated.

Even though osteophytes were common, results show that surprisingly few alterations met the criteria for OA. The hip was the most affected joint, showing OA in 15.2% of all individuals. Between sites, urban Sigtuna show a higher frequency of OA in the hip (21%) whereas individuals from rural Kopparsvik demonstrated the highest frequency of OA in the shoulder (9.8%). The only sex differences were seen in the shoulder and knee joints with women more often affected. Individuals above 40 years of age exhibited significantly more evidence of OA in the shoulder and hip than younger individuals. Differences between archaeological sites are believed to be related to varying ways of life.

Klement L.-L.¹, Keller C.², Weberstorfer M.² and Teschler-Nicola M.^{2,3}

¹University of Mainz, Germany.

²University of Vienna, Austria.

³Natural History Museum Vienna, Austria.

Poster

Ankylosing Spondylitis or Diffuse idiopathic skeletal hyperostosis in historic specimens from Mautern (Lower Austria)

Keywords: *Diffuse idiopathic skeletal hyperostosis, ankylosing spondylitis, differential diagnosis, modern*

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age, Lower Austria.

Diffuse idiopathic skeletal hyperostosis (DISH) and ankylosing spondylitis (AS, Bechterew's disease) are both diseases affecting the spine and showing symptoms of ankylosing. Just taking a glance at them one can easily confuse these diseases. While AS was first described in 1893 by Wladimir Bechterew, it took 60 more years to discover that DISH is something different. It was Forestier and Rote-Querol who were the first to fully describe a case of DISH in 1950. Since then it became obvious that many diseases in historic populations first described as AS, were in fact cases of DISH (Aufderheide et al. 1998, Crubezy 1993, Rogers et al. 1994)

Here we present cases identified during a systematic paleopathological screening of individuals excavated at a historic cemetery (occupation period from 1560 to 1911) in Mautern, Lower Austria. The specimens were analyzed macroscopically as well as with x-ray.

Both individuals exhibit an ankylosed spine and strong calcification of the spinal ligaments and enthesopathies at the patellae and calcanei. While one of the individuals (female, 40 - 55 years) shows alterations which represent a progressive stadium of DISH (including a rarely observed ossification of the interspinous ligament), the other individual (male, 55 - 70 years) exhibits a pattern of features which may either be related to DISH or AS. We recorded, documented, compared and discussed the symptoms for differential diagnostic purpose by using a chart.

This study will contribute to questions of differential diagnosis of DISH and AS in taphonomically altered ancient skeletal remains.

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Kozakaitė J.

Vilnius University.

Podium

The Analysis of Long Bone Fractures and Dislocations in 14th-17th century Alytus,

Lithuania

Keywords: *Medieval, Lithuania, long bones, fractures.*

Injuries, whether accidental or intentional, were of recent topic in papers. While cranial lesions are often regarded as evidence of violent encounters, long bones fractures are associated with less dramatic events and reflect environmental, occupational or accidental event.

This study investigated long bone fractures in a skeletal assemblage from the 14th-17th centuries in Alytus, Lithuania. Originating from the beginning of the Catholic conversion in Lithuania, this population represents a typical medieval town of the period.

A total of 116 injuries (fractures and dislocations) were observed among 88 individuals (11.75% of total individual count), with males accounting 74.45% of the fractures. Injuries were more common to the upper extremities, which accounted for 77.59%, while the lower extremities sustained only 22.41%. The ulna was the most frequently fractured bone (43.1% of all fractures). The dominant fracture type was oblique (60.34%), demonstrating a high incidence of indirect injuries. All fractures examined in this population were well healed, indicating that they had occurred years prior to death. No exceptional variation between periods of time could be distinguished. Results also suggest that this community experienced a low risk of long bone fractures and dislocations compared with similar period populations.

This study revealed a universal model which indicates that males tend to belong to higher-risk groups, 'injury recidivism' with accumulation of trauma vestiges can be observed in the elderly, and therefore, age and sex may demonstrate patterns of injury.

Kozłowski T.¹ and Krajewska M.²

Nicolaus Copernicus University, Faculty of Biology and Earth Sciences, Department of Anthropology, 9 Gagarina St., 87-100 Toruń, Poland.

Poster

Periostitis of tibia in historical subadult skeletal populations from Poland. Comparative study

Keywords: *periostitis, subadult skeletons, Poland.*

Subperiosteal new bone formation, observed on the long bones, are the result of an inflammatory process involving the periosteum (periostitis). This new bone formation, occurs as a response to extrinsic or intrinsic pathological factors. They have been related to more than one disease (infections, haematopoietic, metabolic

and neoplastic or even trauma). These lesions in archaeological skeletons have proven very informative about patterns and levels of community health and biological and cultural adaptation.

The aim of this paper is to present the results of research on the frequency of infant tibia periosteal reactions in populations differing in socio-economic status.

Data were collected and analysed on subadult skeletons from differentiated (territorially and chronologically) cemeteries of medieval and modern North Poland in Kałdus (10th – 13th century), Gruzno (12th – 14th century), Kamionki Duże (16th – 18th century), Inowrocław (late Middle Ages - Modern), and Płonkowo (14th – 19th century).

The results indicate that skeletal populations differ significantly in frequencies of periostitis of the tibia. It can be concluded that the observed differences in the frequencies of periostitis reflect the differences in lifestyle and living conditions of these groups.

Work was supported by Polish Ministry of Science and High Education project No. N N303 822140.

Kozłowski T.¹ and Krajewska M.²

Nicolaus Copernicus University, Faculty of Biology and Earth Sciences, Department of Anthropology, 9 Gagarina St., 87-100 Toruń, Poland.

Poster

Paleopathological interpretation of changes occurring on the skull of the child uncovered on the settlement of the Lusatian culture (8th – 5th century BC) in Gzin (North Poland)

Keywords: *infant skull, possible scurvy, Lusatian culture, Iron Age, Poland.*

During excavations of a Lusatian culture settlement, which flourished in the final period of the Iron Age (Hallstad D, 8th – 5th century BC) in Gzin (North Poland), archaeologists discovered several pits. Few of the pits contained human skeletal remains, including the well-preserved skull of a child who died at the age of 7-9 years. In the Lusatian culture, the predominant funeral rite was cremation. Skeletal burials are extremely rare, and human remains discovered in similar places are considered to be evidence of possible unknown cult rituals, of which human remains were subjected. The possibility of cannibalism is not excluded.

The child's skull displays a number of isolated pathological changes. It is particularly pronounced within the left orbital roof, showing a mass of extremely porous and hypertrophic cortical bone formation, and

the surface of the left temporal fossa (sphenoid greater wing). An amorphous mass and hypertrophic changes occurring on the skull are probably associated with calcified hemorrhages (hematoma) and periosteum stimulated to the new bone formation. The studied skull was radiologically examined, including a CT scan. Macroscopic examination of the observed lesions, along with the radiological characteristics and their location, allow a hypothesis that the cause of massive bleeding (hemorrhages) on the bottom of the orbital roof and the temporal fossa can be evidence of significant vitamin C deficiency related to scurvy.

Noteworthy is the fact that the examined prehistoric skull is the first case of possible scurvy observed in the Iron Age Lusatian culture populations from the region of contemporary Poland.

Work was supported by Polish Ministry of Science and High Education project No. N N303 822140.

Krais S.

Poster

Poorer Health in Late Roman immigrant soldiers?

Keywords: *paleopathology, migration, Late Roman, soldiers, standardization.*

Since stable isotope ratios seem more reliable than earlier approaches such as the interpretation of grave goods or skull shapes, issues of prehistoric migrations are more workable. Recent migration studies indicate that immigrants tend to suffer from poorer health than locals. Causes are mostly incidental to social status: low social status or poor living conditions lead to the decision of migration (push-factors), and immigrants often step into underprivileged social statuses within the destination community. In history of medicine, the coherence of health and social status is called an 'absolute term'. But since migration and its context events are highly heterogeneous, generalizations need to be avoided.

This study examines the health status of immigrants and locals within a group of Late Roman soldiers. Only little is known about living conditions of Late Roman soldiers since written sources are rare. The Roman fort of Neuburg/Donau is located at the Donau-Ilker-Limes and the fort's cemetery dates back to the end of the Roman empire (approximately A.D 330 to A.D 400). The burial site contained 133 excellently preserved skeletons. Bones and teeth of 70 skeletons have already been examined for the stable strontium isotope ratios and 27 soldiers could be identified as immigrants.

To reconstruct health and social status of the

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immigrant and local soldiers, very detailed, mostly macroscopic paleopathological examinations were conducted, including life span, body height and skeletal robusticity, porotic hyperostosis, periosteal reactions, degenerative joint disease, linear enamel hypoplasia and dental health. Additionally, to contribute to the need of the standardization of data to allow reasonable data comparison during paleopathological investigation, description and interpretation have been strictly separated, standardized inquiry systems have been used and programmed working sheets with included databases have been created. Preliminary results will be presented.

Krenz-Niedbala M. and Łukasik S.

Adam Mickiewicz University in Poznan, Faculty of Biology, Institute of Anthropology, Department of Human Evolutionary Biology, Umultowska 89, 61-614 Poznan, Poland.

Podium

How serious is the impact of the method of timing estimation of linear enamel hypoplasias on the results of a study?

Keywords: *enamel defects, LEH, age estimation, Roman Period.*

In paleopathology there is a need for methodological standardization. In the studies of enamel hypoplasia, however, various analytical approaches are adopted in relation to the minimum number of observations, qualification of teeth for the research, choice of the method for defect timing estimation, and the way of gathering and calculating the data. This study is focused on the comparison of three methods for estimating ages of linear enamel hypoplasia formation.

The skeletal material comes from the burial ground in Kowalewko, central-western Poland, dated to 1st c.-3rd c. A.D. 835 permanent teeth of 79 individuals were examined. Linear enamel hypoplasia (LEH) was scored on incisors, canines, and premolars. Three methods were used for estimation of LEHs timing: a conventional method based on the Massler et al's chart, a corrected method accounting for hidden cuspal enamel proposed by Goodman & Song and the Reid & Dean method. In the third approach, the data were calculated both for the mean heights of the European tooth crowns given by Reid & Dean and for the mean heights of unworn tooth crowns from Kowalewko.

There were 48.1% of individuals and 18.6% of teeth affected by LEH. The conventional method revealed two peaks of defects: at 2.0-2.5 and 3.0-4.0 years of age. The corrected method provided only one peak, moved, by later timing assessed for incisors, to the

age category: 4.0-4.5 years. The Reid & Dean method provided a half-year later peak for maxillary incisors than the previous two methods. For maxillary incisors and mandibular canines the peaks were different when the calculation was based on the European crown heights than on the heights derived from the sample studied. It seems that one should be cautious while choosing the timing estimation method for the sample that consists mainly of incisors.

Laffranchi Z.¹, Martín-Flórez J.S.¹, Jiménez Brobeil S.A.¹ and Salzani L.²

¹Laboratorio de Antropología Física, Universidad de Granada.

²Soprintendenza per i Beni Archeologici del Veneto, Nucleo Operativo di Verona.

Poster

A Case of Foot Polydactyly in a Preroman-Celtic Skeleton from the City of Verona (Italy)

Keywords: *Celts, Roman, post-axial polydactyly, foot, genetic malformation.*

In this study we report a case of foot bilateral polydactyly in a male individual buried in a native/Roman necropolis (II-I sec. aC) of a Roman influenced Celtic culture (Galli Cenomani) found in the city of Verona (Italy) between 2005 and 2010.

The project for the construction of an underground garage in the main courtyard of the Bishop's Seminary at Verona led to the discovery of the cemetery. The archaeologists have found the remains of 174 individuals (108 sub-adults and 66 adults). The chronology of these burials is associated with a period of cultural and political transition in the area of different historical traditions, for example the encounter of Celtic populations (late Iron Age groups) with the first Roman communities in the region. Archaeologists consider that this cemetery could belong to the first inhabitants of the urban area of Verona.

The individual presented here (US 2807) is middle-aged male (45-50 years) buried in a dorsal decubitus position alongside the burial of a mature woman (US 2808). The skeleton is in a good state of preservation. Grave goods consist of a ceramic container and two bent iron plates (interpreted as a small barrel). The estimated stature of this individual is 176.3 cm. (SD 3.01 cm.)

This male presents one extra digit on the fibular side of each foot. We consider that this is a case of bilateral post-axial polydactyly with fork (Y shape) of both fifth metatarsals. Variation on the cuneiform bones is also documented as well as other pathological conditions that could be associated with this congenital

anomaly. Even though polydactyly is fairly common, this congenital condition is not well documented in archaeological samples.

Participation to the Cockburn prize for students.

Leandro I.¹, Rodrigues C.³ and Umbelino C.^{1,2}

¹Department of Life Sciences, University of Coimbra, Portugal.

²CIAS - Research Centre for Anthropology and Health.

³CAM- Campo Arqueológico de Mértola, Portugal.

Poster

Ectopic eruption of an inferior permanent molar from the Medieval Necropolis of Alcáçova do Castelo, Mértola, Portugal

Keywords: *ectopic eruption, lower second molar, mandibular ramus, Medieval, Portugal.*

The Medieval Necropolis of Alcáçova do Castelo is located in Mértola, Southern Portugal and dates from 14th to the 16th centuries. The archaeological campaigns started in 1978 under the supervision of Campo Arqueológico de Mértola (CAM) and continues nowadays, from which more than 700 graves were excavated. The Department of Life Sciences from the University of Coimbra have been the opportunity to analyse the skeletal material retrieved from this necropolis.

We now present a pathological case observed in skeleton 535 excavated in 1995 that belongs to a middle age female individual. She presents a molar abnormal eruption. The lower second permanent right molar has an ectopic eruption on the mandibular ramus. On the opposite side the lower second permanent left molar is in his right position and the mandibular ramus can not be evaluated since it is broken. The remaining teeth are present with the exception of the first left premolar, lost post mortem, and both third molars (agenesia).

The ectopic eruption of the second molar is not that common in the literature. The possibility of being a third molar and not a second one was excluded not only by the morphology of the tooth, very similar with its symmetrical, but also by a radiograph that showed no unerupted tooth. Besides the chance of the right second molar being lost ante mortem with complete alveolar resorption is not also plausible since there are no compatible evidences in bone and in the radiograph.

There are no records of similar cases in past populations. The cases mentioned regards the third molar teeth, with few reports in the archeological field but abundant in clinical literature.

Le Bailly M.¹, Landolt M.² and Bouchet F.³

¹University of Franche-Comté, CNRS UMR 6249 Chrono-Environment, 16 Route de Gray, 25030 Besancon cedex, France.

²PAIR, CNRS UMR 7044, 2 Allée Thomas Edison, ZA Sud, CIRSUD, 67600 Sélestat, France.

³Associated member of GEGENA² (EA 3795), University of Reims Champagne-Ardenne, Centre de Recherche en Environnement et Agronomie (CREA), 2 esplanade Roland Garros, 51100 Reims, France.

Podium

Recovery of helminth eggs from First World War German trench latrines in France

Keywords: *Paleoparasitology, Helminth, Latrines, Modern period, First World War.*

The modern wars between France and Germany left many traces in northern and eastern France. The vestiges of these conflicts, often considered as perturbing and sometimes dangerous, have recently become of interest for archaeology. In this sensitive context, excavations have demonstrated the importance of combining the study of literature with modern archaeology to draw a picture of the soldier's way of life.

For the first time in the study of ancient parasites, analyses were undertaken on fifteen sediment samples taken from a First World War settlement in France (Geispolsheim, region of Alsace). Microscopic examination of the material revealed the presence of three common human parasites: *Trichuris trichiura*, *Ascaris lumbricoides* and *Taenia* sp.

Paleoparasitological studies in Europe show that these three parasites have infected human for centuries. Despite this recurrence, literature shows that knowledge about these helminths was limited, as well as many others, and their biological cycles were only recently elucidated. This study provides additional information about the German soldier's way of life, together with health and sanitary conditions in the trenches during the first modern world conflict.

Lee O.Y.C.¹, Minnikin D.E.¹, Besra G.S.¹, Baker O.², Dutour O.², Erekat S.³ and Spigelman M.⁴

¹School of Biosciences, University of Birmingham, Birmingham, UK.

²Laboratoire de Paléanthropologie EPHE, UMR 5199 PACEA, Université Bordeaux 1, Talence, France.

³Al-Quds Nutrition and Health Research Institute, Faculty of Medicine, Al-Quds University, the West Bank, Palestinian Authority and The Koret School of Veterinary Medicine, The Hebrew University of Jerusalem, Rehovot, Israel.

⁴Kuvin Center for the Study of Infectious and Tropical Diseases and Ancient DNA, Hadassah Medical School, Hebrew University, Jerusalem, Israel and Centre for Clinical Microbiology (M9),

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Royal Free Campus, University College London, London, UK.

Podium

Biomarker evidence for ancient tuberculosis in the so-called “Fertile-Crescent”. Is this the location of the oldest cases of human disease?

Keywords: *Tuberculosis, lipid biomarkers, evolution, “fertile crescent”.*

Currently favoured scenarios suggest that modern tuberculosis moved with *Homo sapiens* “out of Africa” following an “evolutionary bottle-neck” in the disease. It appears that migratory human populations settled down in the so-called “fertile crescent” bordering the Eastern Mediterranean. Clear evidence of tuberculosis was demonstrated in 9 kyr BP skeletons from the pre-pottery settlement of Atlit Yam and many examples have been recorded for mummified material from ancient Egypt. The use DNA and lipid biomarkers is increasingly decisive in confirming the distribution and spread of ancient tuberculosis.

Extrapolations of genomic data indicate that tuberculosis is a very ancient disease, but evidence for the disease in humans has not been found for samples older than around 10 kyr BP; this contrasts with skeletal evidence for tuberculosis in Pleistocene megafauna up to 100 kyr BP. It is important, therefore, to define the age limits for tuberculosis in humans and this communication describes a search for lipid biomarkers in old specimens from Dja’de El Mughara and Tell Aswad in modern Syria and ancient Jericho. The Dja’de El Mughara site (10.5 – 10.2 kyr) is classified as early Pre-Pottery Neolithic B (Early PPNB) with no evidence for plant or animal domestication. The later Tell Aswad settlement (9.8 – 8.6 kyr) is Middle PPNB is characterised by evidence of early animal and plant domestication. The Jericho specimens are not yet precisely dated but they correspond to the Middle to Early Bronze age. Representative specimens have been successfully processed for lipid biomarkers reinforcing the distribution of tuberculosis in this important paleogeographic area. A detailed comparison of the lipid profiles will be made in order to record similarities or differences in these ancient human tuberculosis cases.

Lemmers S.A.M.¹, Janssen M.², Waters-Rist A.¹, Grosskopf B.³, Hoogland M.¹ and Amkreutz L.⁴

¹Laboratory of Human Osteoarchaeology, Faculty of Archaeology, Leiden University.

²Department of Rheumatology, Rijnstate Medical Centre Arnhem.

³Historische Anthropologie und Humanökologie, Johann-Friedrich-Blumenbach-Institut für Zoologie und Anthropologie, Georg-August-Universität Göttingen.

⁴National Museum of Antiquities (RMO), Department of Prehistory.

Poster

The Chieftain of Oss: New perspectives on an Iron-Age individual with DISH

Keywords: *Cremation, DISH, Iron Age, Histology, Age-estimation.*

One of the most well-known Iron Age graves from Dutch prehistory is the so-called ‘Chieftain’s grave’ from Oss. The grave, dated to the Early Iron Age (800-500 BC), was situated within a substantial burial mound. The burial is the most elaborate of its kind from the Netherlands. It contained fragmentary, but relatively well preserved cremated remains from one individual and many valuable and elaborate imported goods from the Central European Hallstatt area. Previous research on the cremated remains suggested they could be attributed to a robust man of old age, suffering from a condition known as Diffuse Idiopathic Skeletal Hyperostosis (DISH). This has been subsequently interpreted as suggestive of serious movement restriction, potentially combined with relatively high levels of body fat. The tendency to overemphasize the physical limitations of individuals with DISH has been very determinative and emblematic for perceptions of the Iron Age society in the Netherlands, suggesting that older adult males, with high social status resulting in access to rich foods and a less physically demanding lifestyle, were the leaders of society.

This paper presents new morphological data suggesting the individual may have been younger than previously suggested. These results will be compared to newly acquired histological data. Furthermore, the implications of DISH on mobility and physical capabilities will be re-evaluated using modern clinical data which indicate that most individuals with DISH have no physical limitations. This research will shed new light on the best known leading figure from the Iron Age in the Netherlands. This is especially relevant since the cremations from the Chieftain’s grave are the only human remains available for research from this type of ‘princely burial’ from the Netherlands. These new results call for reconsideration of our understanding of the individual’s social status and position, and with that, our reconstruction of Iron Age society.

Le Roux G.M.

Durham University.

Poster

Pharaoh’s Workers: the history and bioarchaeology of occupational health in

ancient Egypt

Keywords: *history bioarchaeology occupation health Egypt.*

Historical sources from Ancient Egypt provide evidence for the awareness of occupational related injuries and their medical treatments. A medical text entitled the Edwin Smith Surgical Papyrus (written circa 1550BC) is a treatise containing medical descriptions and treatments for a variety of soft tissue and musculoskeletal injuries that include fractures, sprains and dislocations. Artistic sources include the painting from the tomb of Ipy in Deir el-Medina (circa 1250BC) that depicts workmen sustaining injuries whilst building. These include head, limb and eye injuries. Several sites in Egypt have been excavated that are known to be workers' villages for those involved in building projects for the pharaoh. Cemeteries have also been found nearby. These villages and cemeteries are situated at Giza, Kahun, Deir el-Medina and Amarna. An analysis was carried out of the available osteological literature from these sites (particularly Giza (circa 2550BC) and Amarna (circa 1340BC)). There was clear evidence for pathologies that may be associated with occupational activity and injury. These include fractures, degenerative joint disease/osteoarthritis and 'back stress'. Furthermore, there was evidence to suggest a higher prevalence of degenerative joint disease/osteoarthritis in males and workers, compared to females and officials. Analysis of the bioarchaeological findings corroborates the historical evidence from the medical papyrus and tomb painting. Accounting for certain limitations, this would suggest that the historical evidence provides a fairly reliable indicator of the pathologies that are indeed found amongst the working population of Ancient Egypt.

Link K., Dohr D. and Rühli F.

Centre for Evolutionary Medicine, Institute of Anatomy, University of Zurich, Switzerland.

Poster

The Galler Pathological Human Bone Collection and Database

Keywords: *bone, palaeopathology, history, reference series, Switzerland.*

The Galler pathological bone collection, a unique historic reference collection, can serve to study morphologically osteological disease processes. Such series are a valuable tool for palaeopathologists, anthropologists and for the study of the evolution of disease. The collection contains bone samples from

1746 individuals from the time span 1933-1977 stored at the Centre for Evolutionary Medicine, Institute of Anatomy, University of Zurich, Switzerland and 597 individuals from time span 1925-1970 stored at Natural History Museum, Basel, Switzerland (Rühli et al., 2003). The individuals age at death ranges from between 1-99 years.

Autopsy reports are available for most individuals. Digital and analog photographs exist for all of the bones in the collection. For the part stored in Zurich, a database was created and lists by keywords the medical diagnosis, cause of death and osteological diagnosis. In addition, histology, x-rays, CT-scans and micro-CT scans are available for selected cases. Typical diseases and medical conditions found include traumatic fractures, pathological fractures, osteoporosis, infectious diseases, metabolic diseases, neoplastic diseases and congenital diseases. The database shall be available online as of summer 2012 and be accessible for researchers worldwide. Publications based on this sample to date include e.g. studies on fracture healing or specifically on bone tuberculosis.

Link K.¹, Papageorgopoulou C.², Gutteck U.³, Müller D.³, Rühli F.¹, Van Hove M.-L.⁴ and Bianucci R.^{5,6}

¹Centre for Evolutionary Medicine, Institute of Anatomy, University of Zurich, Switzerland.

²Laboratory of Anthropology, Department of History and Ethnology, Demokritus University of Thrace, Komotini, Greece.

³Medication Analyses and Toxicology, Institute for Clinical Chemistry, University of Zurich, Switzerland.

⁴SPW-DG04- Département du Patrimoine, Service de l'Archéologie- dir. du Barbant wallon, Wavre, Belgium.

⁵Laboratory of Criminalistic Sciences Department of Anatomy, Pharmacology and Legal Medicine, University of Torino, Torino, Italy.

⁶NMHEMC Research Foundation Albuquerque NM 87122 USA.

Podium

Chemical, Radiological and Histological Investigations of Mediaeval Mummified Brains Found in Belgium

Keywords: *GC/MS, histology, mediaeval, mummified brains, radiology.*

An excavation campaign carried out between 2009 and 2011 at Grand-Place, Nivelles (Belgium) uncovered two parish cemeteries. Both single and multiple burials were identified and, in several cases, soft tissues, including brains and other internal organs, were recovered. More specifically, 14 mummified brains dating between the X century and XV century were found.

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Here we report on the macroscopic, histological, radiological and chemical changes the brains have undergone, as well as the cause of mummification.

The macroscopic preservation of the brains varied from nearly complete hemispheres to multiple fragments. We could identify cerebral hemispheres, lateral ventricles, corpus callosi, cerebelli, brain stems, sulci and gyri. Preliminary micro-CT results indicate preservation amongst others of grey and white matter. The histological investigations are still in progress.

The analysis of brain lipids and fatty acids using Gas Chromatography/Mass Spectrometry (GC/MS) indicated a high concentration of saturated fatty acids; especially of stearic, myristic, palmitic and in some samples 10-hydroxystearic acid. These acids have been identified as the main constituents in adipocere formation and their presence indicate adipocere as the main mummification mechanism. This interpretation fits with the chemical composition of the burial ground, which is prevalently composed of clay and silt with a high degree in water saturation. Small differences in the fatty acid values between the brains correlated with their macroscopic picture may reveal the influence of additional taphonomic factors at a micro-environmental level.

This sample of mummified mediaeval brains is unique and its multidisciplinary study reveals insights into the process of mummification of neural tissue.

Lombardi G.P.

Laboratorio de Paleopatología, Cátedra Pedro Weiss, Universidad Peruana Cayetano Heredia, Lima, Peru.

Podium

Revisiting the Tres Ventanas Caves Mummies in Peru: Oldest in the World?

Keywords: *Mummies, Paleolithic, Hunters-Gatherers, Conservation, Paleopathology.*

The Tres Ventanas caves mummies were discovered 46 years ago. Possibly the oldest in the world, dating back from locally pre-agriculture and pre-ceramics times (8.000 – 10.000 B.P.), their bodies remain sealed in an air-tight display case at MUNABA museum, in Lima, Peru. This paper revisits them as well as it pays homage to Dr. Frédéric Engel (1908 – 2002) and Prof. Bernardino Ojeda, discoverers.

The Tres Ventanas mummies' display case includes two mummified infants (Cave 1; 6.000 B.P.), one adolescent, mainly skeletonized, and possibly, another one or a young adult still wrapped in layers of camelid fur (Cave 2; 8 – 10.000 years B.P.). The

latter bodies were found buried at the lowest depths of cultural occupation at the end of a 20-meter long cave, associated to remnants of a circular hut and a hearth. Their paraphernalia includes camelid fur and stitched leather clothing, reed nets and donought-shaped cushions, and stone spear points. Culturally, they all belonged to the late paleolithic period, when nomadic hunters and gatherers began to experiment with other survival strategies, thousands of years before the introduction of ceramics and cotton use in the Andes.

These very old bodies provide us with yet another rare opportunity to see our ancestor up close. Why they died so young? Disease? Conflict? This paper proposes some possible answers.

The utmost objective of this paper is to bring this valuable collection back to the scientific community's eye and to design the best multidisciplinary strategy to study and preserve them once the display case is, as scheduled for 2013 by its custodian museum, opened.

Lösch S.¹, Moghaddam N.¹, Ross S.², Müller F.³ and Langer R.⁴

¹Department of Physical Anthropology, Institute of Legal Medicine, Bern University, Switzerland.

²Centre of Forensic Imaging, Institute of Legal Medicine, Bern University, Switzerland.

³Bernisches Historisches Museum, Bern, Switzerland.

⁴Institute of Pathology, University of Bern, Switzerland.

Poster

A Case Of A Malign Tumour In Iron Age Switzerland

Keywords: *Münsingen Rain, Switzerland, humerus, malign tumour, osteosarcoma.*

The famous La Tène burial site of Münsingen Rain in Switzerland was discovered in 1904. The individuals were dated by horizontal stratigraphy to 420 - 240 BC. This exact chronological dating makes Münsingen Rain the most important Iron Age burial site.

One of the 77 individuals showed an alteration of the bone, so the skull, the left humerus with scapula and the right femur were retained. In „Diseases of Antiquity“, the humerus of this individual was discussed as an osteosarcoma (Brothwell and Sandison, 1967). At that time methods like radiology, CT, or histology were not applied. The aim of this study was to reconsider this differential diagnosis and examine it with modern methods.

Sex and age were determined anthropologically. Radiological examinations were performed with plain x-ray imaging and a multislice CT-scanner. For

histological analysis, a fragment of the lesion was taken from the back side of the humerus. Pathologic processing with staining after fixation, decalcification, and paraffin embedding was performed. Hard cut sections were also prepared.

The individual is male, the estimated age at death is more than 60 years. There is a malignant bone forming tumour at the left proximal humerus with extraosseous growth and involvement of the adjacent scapula. Radiologic examination showed a large, mainly sclerotic tumour. The 'sunburst' appearance of the periphery is a sign for an aggressive malign periosteal reaction. Histology showed an irregular bone formation consistent with osteoid matrix.

In summary, there are two major differential diagnoses: if the tumour in the humerus represented a single lesion, it can be considered as a primary malignant bone tumour. Due to the irregular matrix formation resembling osteoid, the most likely diagnosis is an osteoblastic osteosarcoma - despite the age of the patient and the rather uncommon site -, followed by chondrosarcoma with osteoblastic features.

Literature:

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Lösch S.¹, Struck U.², Zink A.³ and Meier T.⁴

¹Department of Physical Anthropology, Institute of Forensic Medicine, University of Bern, Switzerland.

²Museum für Naturkunde, Humboldt University Berlin, Germany.

³EURAC Research Institute for Mummies and the Iceman, Bolzano, Italy.

⁴Institut für Ur- und Frühgeschichte und Vorderasiatische Archäologie, Ruprecht-Karls-University Heidelberg, Germany.

Podium

Project Petersberg – A Stable Isotope Study Of A Medieval Population In Southern Bavaria (Germany)

Keywords: *medieval times, monks, Bavaria, northern alpine region, stable C, N and O isotopes.*

The interdisciplinary Project Petersberg investigates a medieval population from southern Bavaria (Germany). A broad range of methods provides information about skeletons excavated at this mountain.

In 1163 AD a monastery was built on mountain top of the Petersberg. The skeletons of its cemetery mostly date to the 10th-14th century AD. The aim of the study was to find out who was buried here and if it was

possible to determine which skeletons belonged to the supposed monks.

All individuals underwent an anthropological and palaeopathological examination. There were analyses of stable C, N, and O isotopes. Selected individuals were aDNA tested for *Mycobacterium tuberculosis*.

The archaeologists divided the cemetery in three areas. It was also possible to distinguish between *in situ* and disturbed burials. Altogether, 153 adults and 70 children and youths were examined. The distribution of sex and age classes is different between the areas. The monks were most likely buried in the southeast area and some of their burials later disturbed. An increased percentage of skull lesions can be associated with the destruction of the monastery which is archaeologically documented and historical bequeathed. DNA tests showed that two individuals were infected with *Mycobacterium tuberculosis*.

The analysis of stable C and N isotopes revealed that the Petersberg subsistence economy was quite heterogeneous; there is almost no difference between women and men. But there are significant differences regarding the age at death: most people died when they were children, youths, or had reached high ages. O-Isotopes showed that some individuals had consumed different water than the rest of the Petersberg population. Apparently, those were also grouped at particular cemetery areas on purpose.

Łukasik S. and Krenz-Niedbała M.

Adam Mickiewicz University in Poznan, Faculty of Biology, Institute of Anthropology, Department of Human Evolutionary Biology, Umultowska 89, 61-614 Poznan, Poland.

Poster

The ancient population of Scythians. Introduction of a research project

Keywords: *Scythians, nomads, antiquity, stress markers, health indicators.*

A planned Polish-Moldavian research project on a unique Scythian skeletal material is presented. Scythians were Indoeuropean people, inhabiting the steppes to the north of the Black Sea, between the rivers Dniester and Don, on the territories of today's Ukraine, Russia and Moldova. They created a nomadic civilization, but both its origin and decline have not been fully recognized. The beginnings of the Scythians' presence on those steppes date to about 7th B.C. However, their descent has not been determined yet. Some researches regard them as autochthonic and some as allochthonic inhabitants. Scythians were pastoralists, but also warriors, and one of the first people who mastered

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the art of horseback riding. In antiquity they played a very significant role, and after a series of wars they occupied vast areas of Eurasia. So far relatively few anthropological studies of the Scythian remains have been done, since the skeletal material is rather scarce and poorly preserved.

The osteological collection to be examined derives from the site Glinoe, dated to the 3rd-2nd c. B.C., located c. 25 km to the south-east from the city Tiraspol (Moldova). The anthropological analysis will be performed on bones and teeth of 190 individuals, excavated from 110 burial mounds (kurgans) in the years 1995-2012 by the Archaeological Laboratory from the Taras Shevchenko University of Tiraspol.

The research project will be carried out within an agreement established between the Adam Mickiewicz University in Poznan, Poland and the Taras Shevchenko University of Tiraspol, Moldova. It will be realized in two steps. First, skeletal indicators of the health status and stress will be examined and then, the chemical and molecular analyses will be performed to assess the diet, directions of migration, kinship and the origin of the studied Scythians.

Lynnerup N.¹, Schröder Jakobsen L.¹, In Sun Lee² and Dong Hoon Shin³

¹Institute of Forensic Medicine, University of Copenhagen, Denmark.

²Department of Radiology, Seoul National University Hospital, Korea.

³Department of Anatomy, Seoul National University, Korea.

Poster

CT-based segmentation and visualization of mandibular pathology in a Korean mummy

Keywords: *CT, image segmentation, trauma, hematoma, infection.*

We present the results of performing image segmentation and 3D visualization in order to clarify and corroborate previous CT-imaging and partial dissection of mandibular pathology in a Korean mummy. The mummy dates to the 17th century, and is one of several Korean mummy finds, notable for their extraordinary preservation [1].

Previous CT-image analyses found what was stated to be a traumatic mandibular fracture, resulting in an inability to eat, and hence ultimately the death of the individual [1]. Our image analysis, done using slice-by-slice segmentation revealed that while there was a mandibular fracture, the fracture has an unusual morphology. Further, we found evidence of bone resorption, as well as development of abscessing. The

fracture occurs just around the socket for the 2nd left molar, which is missing, and the 3rd molars seem to be impacting. We thus propose that a differential diagnosis may be impacting between 2nd and 3rd molar, leading to periapical infection and abscessing, resulting in sequestration. Possibly there then might have been direct trauma to the side of the face, which resulted in a hematoma (as established by dissection), or there may have been rupture of vessels due to the infection with local spread. Furthermore, it seems that he would have been able to swallow fluids, and thus the ultimate cause of death may be septicemia from the abscessing rather than starvation.

Image segmentation is a potent tool when analyzing CT-scans. All too often in mummy studies, the mummies may be scanned, but the resultant images only analyzed further with the CT-scanner software, which is not optimal. Post-processing, involving slice-by-slice segmentation is crucial to extract all image data from a CT-scan series, especially in mummy studies [2] and produce 3D visualization for the use of paleopathological diagnosis.

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Magalhães B.S.¹ and Santos A.L.²

¹Department of Life Sciences, University of Coimbra.

²CIAS – Research Centre for Anthropology and Health, University of Coimbra.

Poster

Victims of the Inquisition: pathology in unburied individuals from Évora, Portugal

Keywords: *Inquisition, unburied, osteoarthritis, periapical disease, paleopathology.*

The Inquisition operated in Portugal as a religious court between 1536 and 1821. In 2007 and 2008 were excavated in Évora the first known individuals who died in the prison of this court. The human remains, dated from the 16th to 17th centuries, come from an archaeological context of layers of sediment containing domestic waste and apparently the prisoners' corpses were dumped there too.

The sample is composed of 12 adults (3 males and 9 females) and comingled bones. In total, a minimum

number of 16 individuals was estimated. This work will present macroscopic evidence of osteoarthritis and dental pathology, the two most prevalent conditions in the sample. As regards the osteoarthritis, all joints were observed and porosity, lipping and eburnation were recorded. As for oral pathology, periapical dental lesions were recorded in 77.8% (7/9) of the maxillae and in 10% (1/10) of the mandibles.

Despite the small sample size, these individuals are unique for this historical context. The random position of the individuals and the lack of evidence of a funerary ritual, associated with the archeological context, suggest that they were not buried.

The results obtained during osteological observation are interpreted and discussed using the historical documentation available for the Inquisition of Évora. This will help us to better understand who these people were, their living conditions, any torture they may have experienced, diet and diseases they suffered until they died in prison.

Maixner F.¹, Thomma A.², Widder S.², Rattei T.² and Zink A.¹

¹Institute for Mummies and the Iceman, EURAC research, Viale Druso 1, I-39100 Bolzano, Italy.

²Department of Computational Systems Biology, University of Vienna, Althanstrasse 14, 1090 Vienna, Austria.

Podium

Treponema denticola – a causative agent of periodontitis detected in tissue biopsies of the Iceman

Keywords: *Iceman, periodontitis, Treponema denticola.*

Periodontitis, the major cause of tooth loss worldwide, is an ancient disease. Localized alveolar bone loss around the tooth root surfaces indicative for this disease can be already found in fossil records of our early ancestors. In a progressed state these bone lesions can lead in severe cases to the loss of the tooth. Periodontitis is a bacterially induced chronic inflammatory disease associated with a defined microbial composition found on the surface of the tooth and tooth root. Within this diverse microbial community of the dental plaque there are three so-called “red complex” periopathogens (*Porphyromonas gingivalis*, *Tannerella forsythia*, and *Treponema denticola*) predominantly associated with the incidence and severity of human periodontal disease.

Here, we report for the first time the molecular detection of the periopathogen *T. denticola* in ancient human tissue biopsies of the Iceman. Initially, the

metagenomic data of the Iceman’s genomic survey was screened for bacterial 16S rRNA specific reads. By ranking the reads by abundance quite a high number of 16S rRNA reads most similar to *T. denticola* have been detected. Further mapping of the metagenome against the *T. denticola* genome revealed additional reads most similar to this periopathogen. MapDamage analysis of specifically mapped reads suggests an ancient origin of these sequences.

The hematogenous spread of periopathogens often reported in the recent literature could already explain the presence of metagenomic reads specific for *T. denticola* in the Iceman’s bone biopsy. We extended, however, our survey to an Iceman gingival tissue sample and could thereby detect *T. denticola* DNA at the actual disease site.

In summary, our data support previous CT-based indication of periodontitis of the Iceman and clearly underlines the potential to detect pathogens *de novo* by applying metagenomic analysis on ancient human remains.

Marcsik, A.¹, Fogl Á.¹, Vandulek C.², Zádori P.² and Molnár E.¹

¹Department of Biological Anthropology, University of Szeged, Szeged, Hungary.

²Kaposvár University, Health Center, Kaposvár, Hungary.

Poster

Probable metastatic carcinoma in a medieval cemetery from Hungary

The skeletal remains of 387 individuals from the cemetery of the Catholic church and the churchyard of Kiskunhalas (between the rivers Danube and Tisza in Hungary) are dated to the 14th-15th centuries.

The skeletons are currently under study in general anthropological points of view. Until now 125 specimens have been studied. The investigations are carried out with gross morphology and radiological analysis.

Among the observed pathological cases (traumatic lesions, luxation of the hip, serious periostitis/osteomyelitis, porotic hyperostosis) there is an individual revealing special lesions. The disease afflicted a 40-50-year-old male. A number of osteoblastic alterations and some osteolytic lesions were seen on the hip bones. The long bones were also affected by periostitis. The morphology and the pattern of the lesions suggest the diagnosis of a probable metastatic carcinoma. In order to confirm the supposed diagnosis further investigations, such as histological analysis are planned.

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Marinato M.¹, Corsi P.¹, Faresin E.¹, Salemi G.¹, De Marchi M.², Brogiolo G.P.¹ and Canci A.¹

¹Dipartimento dei Beni Culturali: Archeologia, Storia dell'Arte, del Cinema e della Musica - Università degli Studi di Padova.

²Soprintendenza per i Beni Archeologici della Regione Lombardia.

Poster

Interpersonal violence or apotropaic rite? Two cases of cranial perforations from Medieval Italy

Keywords: *cranial injuries, palaeopathology, middle age, nail, Italy.*

The present study concerns two skulls found in burials from two different medieval contexts: one from the monastery of San Salvatore-Santa Giulia in Brescia and the other from the church of San Giovanni Evangelista, in the castrum of Castelseprio, in the proximity of Varese, North-Western Italy. The research was carried out in the Archaeology Laboratories of the University of Padova in collaboration with the Soprintendenza per i Beni Archeologici della Regione Lombardia.

Both skulls shows similar perforations following trauma.

The skull from Castelseprio belongs to a mature male (35-45 years old) and presents a sub-circular perforation measuring 0.9 x 0.6 cm on the left side of the frontal bone of the cranial vault, near the coronal suture. The San Salvatore skull belongs to an adolescent male (15-20 years old) with a circular perforation, measuring 0.8 cm in diameter on the left side of the frontal bone close to the supraorbital margin.

No bone regeneration was observable, thus suggesting a peri mortem or a post mortem nature of the lesions. In the first hypothesis the perforations may have resulted from interpersonal violence (e.g. by arrows), while in the second hypothesis the perforations may have been caused by a nail knocked into the cranial vault as a final blow, or as a magical religious practice.

The aim of this study is to describe and understand the lesions in relation to possible etiological factors by observation of the morphology of the perforations with the help of new technologies of image analysis.

Participation to Cockburn Price.

Marschler M.^{1,2}, Pany-Kucera D.^{1,2}, Leskovar J.^{3,5}, Cemper-Kiesslich J.^{4,5} and Teschler-Nicola M.^{1,2}

¹Natural History Museum Vienna, Department of Anthropology.

²University of Vienna, Department of Anthropology.

³Upper Austrian State Museum.

⁴University of Salzburg, Interfaculty Department of Legal Medicine.

⁵CAMAS - Center of Archaeometry and Applied Molecular Archaeology.

Poster

Rheumatoid Arthritis in individuals interred in an unusual Iron Age context from Leonding, Austria

Keywords: *arthritis, arthropathy, irregular interment, (Early) Iron Age.*

Rheumatoid arthritis is a rarely documented disease in archaeological contexts. A small group of (Early) Iron Age individuals from which a remarkable number revealed this joint disease is described.

In an unusual interment from Leonding, Austria, 17 individuals were found accidentally in a circular burial pit during house construction activities. Unfortunately, about one third of it was destroyed by the digger. In the undisturbed part of the loess pit, the skeletons were found in prone or flexed positions together with remains of superficially scorched wood (piles). It was possible to determine nine relatively complete individuals, and the remains of at least eight more skeletons were recovered from the soil heap.

Macroscopic and radiological reinvestigation of the group revealed that a total of five individuals were affected by the rare systemic erosive arthropathy rheumatoid arthritis (RA). All the postcranial joints were affected including hands and knees. Distinct bony alterations are present symmetrically in three adults (one female, one male, one indifferent) and two subadults. The bones of the individuals are extremely light (suggesting osteoporosis), and the poor state of dental health in this group is considerable. Clinical studies have shown that osteoporosis as well as periodontal disease correlates with RA. The two affected subadults, along with the adults, offer the opportunity to study the progressive nature of this disease. Further, RA is known to occur more frequently within families. To explore kinship in this group, an ancient DNA analysis on samples from some individuals is under progress. Some archaeologists have interpreted this deposition as "human sacrifice". This interpretation will be discussed in the light of the new data.

May H.¹, Dar G.², Stein D.¹, Abbas J.¹, Hershkovitz I.¹ and Peled N.³

¹Department of Anatomy and Anthropology, Sackler Faculty of Medicine, Tel Aviv University, 69978, Israel.

²Department of Physical Therapy, Faculty of Social Welfare & Health Studies, Haifa University, Mount Carmel, Haifa, 31905, Israel.

³Departments of Radiology, Carmel Medical Center, Haifa, Israel.

Podium

Past Populations Predicting the Future of Human Health: the Case of Hyperostosis Frontalis Interna

Keywords: *Hyperostosis Frontalis Interna, Population health, Hormonal disturbance, Biohistory, Osteobiography.*

One of the major challenges of 21st century medical research is to reveal the consequences of the rapid changes in our environment, lifestyle, reproductive behavior and nutrition, on our health. A pathology like hyperostosis frontalis interna (HFI) whose diagnosis and definition is unaffected by medical progress, i.e, diagnostic techniques and disease definition, may allow us to follow these changes. In addition, HFI is rare in historic populations, albeit occasional cases with very high prevalence have been reported.

The aim of this study was to examine whether the prevalence and severity of HFI have significantly changed during the past 100 years.

Two female populations, 100 years apart, were studied; 992 historic and 568 modern females. Detection of HFI was carried out via direct observation or CT images (Philips Medical Systems, Cleveland, Ohio, USA). HFI degree was identified according to Hershkovitz et al.'s (1999) 4-scale definition and according to May et al.'s (2010) 3-scale definition.

Following correction for age, modern females manifested a significantly higher HFI prevalence compared with historic females ($p < 0.05$). The risk of developing HFI was found to be approximately 2.5 times greater in present day females compared with females living 100 years ago ($p < 0.05$). In the young age cohort, present day females manifested a significantly higher prevalence of HFI type B ($p < 0.05$), whereas in the old age cohort, a significant difference in the prevalence of HFI types C and D was noted between the two groups ($p < 0.05$). HFI tended to appear at a younger age in the present population.

The last two decades has witnessed an increase in HFI prevalence, especially among young individuals. This may possibly indicate the impact of the profound change in human fertility patterns, together with the introduction of various hormonal treatments and new dietary habits.

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Medlej B.^{1,2}, Abbas J.¹, May H.¹, Dar G.¹, Stein D.¹, Cohen H.¹ and Hershkovitz I.¹

¹Department of Anatomy and Anthropology, Sackler Faculty of Medicine, Tel-Aviv University, Ramat-Aviv, Israel.

²The National Center of Forensic Medicine, Tel-Aviv Jaffa, Israel.

Podium

Using Femoral Head and Neck Lesions to Predict Habitual Activities in Ancient Populations

Keywords: *femoral head-neck lesions, activity patterns, paleopathology.*

Introduction: Femoral head and neck lesions (FHNL) (e.g., Allen's fossa and Poiriers' facet) manifest different patterns in ancient populations, when compared to modern populations. Our current research aims to analyze the etiology of FHNL and to examine their usefulness as indicators of specific habitual activity in archaeological populations.

Material and methods: The human skeletal material was retrieved from three sources: the Hamman-Todd Osteologic Collection (Laboratory of Physical Anthropology at the Cleveland Museum of Natural History, Cleveland, Ohio) 700 individuals, b) the Liben collection (Kent State University) with 140 individuals, and the c) Tel Aviv University osteological collection (historical populations) with 300 skeletons.

Results: The current study identified four different types of lesions in the femoral head and neck region: the "ditch" type lesion, present in 26.3% of modern individuals, the "Tongue" type, present in 10.8% of the individuals, the "Indentate" type appeared only in 2.1% of modern individuals, and the "sunken" type that appeared in 0.7% of the modern sample. In archaeological populations, 54.0% of the individuals manifested the "ditch" type lesion, whereas the "tongues" type was not detected.

Discussion: FHNL may be of significant paleopathological importance and therefore their presence as a population phenomenon must be recognized and their etiology and pathophysiology clarified. Although very common and of potentially high risk to the individual, FHNL has been largely ignored by the paleopathological literature. The blatant differences in appearance of FHNL between ancient and modern populations may be used as indicators for differential activity patterns in various historical

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settings.

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Meyer C.¹, Held P.¹, Fecher M.¹, Klamm M.² and Alt K.W.¹

¹Institute of Anthropology, University of Mainz, Colonel-Kleinmann-Weg 2, 55099 Mainz, Germany.

²State Office for Heritage Management and Archaeology, Richard-Wagner-Str. 9, 06114 Halle, Germany.

Poster

The Fog of War: Visible and Invisible Injuries and Isotope Analysis of Early 19th Century War Casualties from Fränkenau, Germany

Keywords: *War injuries, trauma, mass grave, isotope analysis.*

In 2004, a small mass grave was encountered in Fränkenau, Saxony-Anhalt during construction work. Upon excavation, associated artefacts, most obviously lead musket balls, suggested an historical, war-related event within the last few hundred years. This was confirmed by the osteological analysis of the skeletons, which show several features, including pipe facets in their dentition, as well as various unhealed injuries. The demographic profile of an all-male sample with a limited age-range between 20 and 35 years suggests a military occupation for the deceased in this particular burial context.

While some osteological features were certainly unrelated to the specific event during which the soldiers were killed, the encountered injuries are a direct consequence of their last engagement. Although the projectiles were found in positions indicating that they entered the soldiers' bodies and presumably caused soft tissue injuries, there is no skeletal evidence of gunshot wounds. Without the detector-aided recovery of the lead musket balls, evidence of these potentially lethal injuries would have been lost. In contrast to these results of fighting from a distance are the traumatic results of close combat. Several perimortem fractures bear witness to blunt force and possibly sharp force attacks aimed at the individuals, including two classic parry fractures.

The combination of archaeological, osteological, and historical information suggests that the skeletons found in the mass grave belong to soldiers killed in the early 19th century, possibly in the battles of Jena-Auerstedt, which were fought nearby in 1806. In the absence of fragments of uniforms worn, various isotope studies are employed with the aim to further reconstruct

the lives and deaths of these people, and to further lift the fog of war surrounding the events of their demise two centuries ago. The confounding effects of invisible injuries are discussed accordingly.

Miliauskienė Ž. and Jankauskas R.

Dept. of Anatomy, Histology and Anthropology, Faculty of Medicine, Vilnius University.

Podium

Dental Chipping in the Middle Iron Age Population from Lithuania: Sexual and Social Differences

Keywords: *dental chipping, Iron Age, sexual differences.*

Dental chipping or microfractures on the tooth crown can provide information about dietary habits and use of teeth as tools in daily activities of past people. However, detailed studies of this microtrauma are still rare. The aim of our study was to evaluate dental chipping in Middle Iron Age (5-6th c.c.) inhabitants from Plinkaigalis (Central Lithuania). Analysis was performed on 157 adult individuals, with established age at death and sex (3454 teeth in total). Dental crowns were evaluated under artificial light and under low magnification. Results revealed that 98% of individuals had at least one tooth with traces of chipping, in total 37.1% of teeth were affected. No statistical differences were found between left and right side and between upper and lower parts of the dentition. Incisors and first molars were among the most frequently affected teeth. Analysis of sexual differences revealed different frequencies and patterns of chipping among males and females. Males had a higher number of chipped teeth, especially in the older ages: over 35 years at death, 52.2% of male's teeth and 38.4% of female's teeth were affected ($p < 0.01$). Moreover, males exhibited an anterior teeth dominant pattern of chipping, while females revealed no differences between anterior and posterior teeth fractures. Males also exhibited differences in chipping frequency according to social status. Individuals, according to the grave inventory defined as poor, had statistically greater numbers of chipped teeth (49.2%) compare to those who were defined as higher status (39.5%, $p < 0.01$). Although all males, despite their social status, revealed anterior teeth dominant pattern, poor males showed a tendency toward increase in posterior teeth chipping. We argue that differences in dental chipping between sexes and among different social groups of males could be attributed to different access to food products and different daily activities of males and females. This assumption was confirmed also by trace element, dental

and osteological analysis.

Minnikin D.E.¹, Lee O.Y.C.¹, Besra G.S.¹, Rothschild B.², Laub R.³, Spigelman M.^{4,5} and Donoghue H.^{5,6}

¹School of Biosciences, University of Birmingham, Birmingham, UK.

²Department of Medicine, Northeast Ohio Medical University, Rootstown, OH 44505, USA.

³Buffalo Museum of Science, Buffalo, NY 14211, USA.

⁴Kuvin Center for the Study of Infectious and Tropical Diseases and Ancient DNA, Hadassah Medical School, Hebrew University, Jerusalem, Israel.

⁵Centre for Clinical Microbiology (M9), Royal Free Campus, University College London, London, UK.

⁶Centre for the History of Medicine, University College London, London, UK.

Podium

The evolution of tuberculosis in the Pleistocene. Where is the evidence for any human involvement?

Keywords: *Tuberculosis, lipid biomarkers, evolution, Pleistocene.*

Robust lipid biomarkers are established as alternatives or complements to DNA analyses in charting the evolution of *Mycobacterium tuberculosis*. A DNA report, a decade ago, suggested that a 17 kyr BP skeleton of extinct *Bison antiquus*, from Natural Trap Cave, Wyoming, was the oldest known case of tuberculosis. In recent studies, this diagnosis was supported by the detection of a portfolio of key lipid biomarkers, namely mycolic, mycocerosic and mycolipenic acids, accompanied by phthiocerols. This establishes the existence of Pleistocene tuberculosis and there are many even older animal bones with well-characterised tuberculous lesions similar to those on the analysed sample. In the current absence of any evidence of tuberculosis in human skeletons older than 9 – 12 kyr BP, the hypothesis that this disease evolved as a zoonosis, before transfer to humans, will be explored.

Very characteristic undermined articular surface lesions have been clearly recognised in a range of Pleistocene megafauna throughout the Northern Hemisphere. In order to support, or otherwise, the results from the 17 kyr North American bison, the investigation of selected extinct bison and mastodon bones will be reported. Indications are that tuberculosis is common in these animal specimens. But there is a dearth of corresponding human skeletal material. No specimens have been identified and secured for analysis. The consensus is that the tubercle bacilli evolved from a free-living *Mycobacterium* aeons ago. Was there

sufficient population density of *Homo sapiens* to act as a vector in such a transition or was it more likely that the certified hordes of Pleistocene animals, roaming the Northern Hemisphere, were the key hosts facilitating the evolution of *Mycobacterium tuberculosis*?

Minozzi S.¹, Bartolini Salimbeni L.R.¹, Lubritto C.² and Fornaciari G.¹

¹Division of Paleopathology, History of Medicine and Bioethics; Department of Oncology, Transplants and Advanced Technologies in Medicine, University of Pisa, Italy.

²Department of Environmental Sciences, - CIRCE Laboratory, Second University of Naples, Italy.

Poster

Oral diseases and palaeonutrition in two Renaissance noble families from Italy

Keywords: *pathologies, isotopic analysis, Italy, Renaissance.*

The aim of this study is to investigate the oral health and dietary intake in two Renaissance skeletal series from Italy by means of palaeopathological examination of the dental remains and palaeonutritional study by stable isotope analysis.

The research concerned the examination of the skeletal remains of two Italian Renaissance samples belonging to important aristocratic families: the Guinigi family from Lucca (Tuscany, 14th- 17th centuries) and the Aragonese Princes in Naples (Campania, 15th –17th centuries).

Caries, calculus, alveolar resorption, abscesses and ante mortem tooth loss were collected in the maxillary and mandibular remains in a total of 72 individuals: 48 individuals from the Guinigi sample and 24 individuals from the Aragonese sample. The paleonutritional study was carried out by means of carbon and nitrogen stable isotope analysis of bone collagen.

The results of the dentolveolar diseases showed a percentage of all pathologies that was higher in the Guinigi than in the Aragonese family. Interpretation of the data was performed in the light of the results of the isotopic analysis, which showed higher values of d15N and d13C in the Aragonese series, suggesting a diet richer in meat and fish compared to Guinigi family. The extraordinary high (64% of affected teeth) levels of dental caries of the Guinigi could be related to some hereditary diseases, such as familiar diabetes.

Minozzi S.¹, Lunardini A.¹, Benassi V.², Caldarini C.², Catalano P.² and Fornaciari G.¹

¹Division of Paleopathology, History of Medicine and Bioethics;

The 19th European Meeting of the Paleopathology Association

Department of Oncology, Transplants and Advanced Technologies in Medicine, University of Pisa, Italy

²Special Superintendence to Archaeological Heritage of Rome, Service of Anthropology Rome, Italy.

Poster

Severe and diffuse periosteal reaction in a child from the Imperial Rome (1st-2nd century AD)

Keywords: *periostitis, children, Imperial Age, Italy.*

The presence of periosteal new bone formation in infantile skeletal remains and its relationship with different etiological factors represents a currently discussed issue. This study regards a case of diffuse, severe periostitis affecting the skeleton of a child from the Roman Imperial Period.

The burial was found in the necropolis of Casal Bertone (1st-2nd century AD) located a few kilometers east of central Rome. The skeleton, almost complete and well preserved, belonged to a child aged 2-3 years, according to development of the teeth. The postcranial bones revealed a growth disturbance, since bone sizes are in accordance with those of infants aged 6-12 months. Pathology includes extensive alterations affecting all the bones: widespread profuse bilateral periosteal reaction and osteopenia were very evident on bone surfaces.

Differential diagnosis and the archaeological and paleopathological problems linked to the presence of this type of pathology, during the Imperial Period, are discussed.

Mitchell P.D. and Anastasiou E.

Department of Archaeology and Anthropology, University of Cambridge, The Henry Wellcome Building, Fitzwilliam Street, Cambridge CB2 1QH, UK.

Podium

Human Intestinal Parasites from a Latrine in the 12th Century Crusader Castle of Saranda Kolones in Cyprus

Keywords: *crusader, latrine, medieval, parasites, worms.*

Saranda Kolones (Forty Columns) at Paphos in Cyprus was one of the best examples of crusader concentric castles, until its destruction in 1222AD. Here we present a study of the contents of a latrine from the castle for evidence of intestinal diseases in order to improve our understanding of the health of crusaders and castle garrisons in the early thirteenth century. The analysis demonstrated the eggs of two species

of helminths, the roundworm and whipworm. From the known effects of intestinal parasites in modern populations, it is likely that a heavy parasitic worm load in a medieval soldier would have predisposed them to death from malnutrition if the castle were to undergo a long siege. Study of several crusade expeditions has shown that around 15-20% of soldiers taking part in a 2-3 year crusade would have died from malnutrition, infectious diseases, or other illness unrelated to weapon injuries. In such environments, intestinal parasites may have been an important disease component. This is the first time that an archaeological latrine from Cyprus has ever been analysed for parasites, and one of the first medieval castles in the Mediterranean region to have done so. These findings help us to reconstruct the health environment of a medieval castle garrison in a vivid manner, by demonstrating the very organisms that caused disease 800 years ago.

Moghaddam N.¹, Langer R.², Ross S.³, Nielsen E.⁴ and Löscher S.¹

¹Department of Physical Anthropology, Institute of Legal Medicine, Bern University, Switzerland.

²Institute of Pathology, Bern University, Switzerland.

³Center of Forensic Imaging, Institute of Legal Medicine, Bern University, Switzerland.

⁴Archaeological Survey of the Canton Lucerne, Switzerland.

Poster

Unusual Case Of Multiple Osteosclerotic Lesions In An Iron Age Skull From Switzerland

Keywords: *Iron Age, Switzerland, skull, osteosclerotic lesions, various methods.*

The single Hochdorf grave was found in 1887 during construction works in the Canton of Lucerne, Switzerland. It dates between 320 and 250 BC. The calvarium, the left half of the pelvis and the left femur were retained. The finding shows an unusual bony alteration of the skull.

The aim of this study was to obtain a differential diagnosis and examine the skull with various methods.

Sex and age were determined anthropologically. Radiological examinations were performed with plain x-ray imaging and a multislice CT-scanner. For histological analysis, samples of the lesion were taken. Pathologic processing included staining after fixation, decalcification, and paraffin embedding. Hard cut sections were also prepared.

The individual is female. The age at death is between 30 and 50 years. There is an intensely calcified bone

proliferation at the right side of the os frontalis. Plain x-ray and CT imaging show a large sclerotic lesion in the area of the right temple with a partly bulging appearance. The inner boundary of the lesion shows multi-edged irregularities. There is a diffuse thickening of the right side. At the left side skull vault is a mix of sclerotic areas and areas that appear to be normal with a clear differentiation between tabula interna, diploe, and tabula externa. Retrospectively CT imaging and plain x-ray showed a wedge-shaped area in the center of the lesion filled with material of lower x-ray density than the adjacent bone. Histology showed mature orderly grown bone tissue.

This is an unusual case of multiple osteosclerotic lesions on the skull. Radiologic and histologic findings favor a benign condition, e.g. multiple osteomas which are described to occur in patients with the hereditary, APC related Gardner Syndrome or manifestation of hyperparathyroidism. However, osteoblastic metastases also have to be considered in the differential diagnosis.

Applicant Cockburn Student Award.

Molnár E.¹, Marcsik A.¹, Bereczki Z.¹, Zádori P.², Vandulek C.², Schultz M.³, Schmidt-Schultz T.⁴ and Pálfi G.¹

¹Department of Biological Anthropology, University of Szeged, Hungary.

²Kaposvár University, Health Center, Kaposvár, Hungary.

³Department of Anatomy, University Medical School Göttingen, Göttingen, Germany.

⁴Department of Biochemistry, University Medical School Göttingen, Göttingen, Germany.

Poster

Malignant tumors in osteoarchaeological samples from Hungary – literature review and new cases

Cancer is one of the leading causes of death worldwide today, however, tumors are not simply diseases of recent advanced societies, but have been a health threat to much earlier populations. Both, benign and malignant forms of tumors are well-known in their occurrence since the Neolithic. The prevalence of cancer in ancient populations might have differed from that of modern humans, probably, because of substantial differences in environmental factors (such as tobacco and alcohol use, diet), life expectancy, and the availability of treatment.

Currently, there is great interest in the occurrence of cancer and bone metastases in the assumedly industrial pollution-free environment of antiquity compared to

the present situation.

This study is based partly on literature data concerning malignant tumor cases in osteoarchaeological samples from Hungary, partly on new paleopathological cases from the same geographical area.

Evidence of primary bone tumors was identified only in a few cases, however, the presence of bone metastases was identified in several cases. Regarding the type of the observed alterations, the predominance of osteolytic lesions has to be mentioned. Concerning the distribution of age of death of the affected individuals it has to be emphasized that the observed cases belonged mostly to older age categories. This observation fits to the generally accepted view that cancer is primarily a disease of old age.

The results provide new information about the paleoepidemiology of malignant tumors and bone metastases.

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Mongelli V.¹, Vitiello A.¹, Campana S.², Lubritto C.³ and Fornaciari G.¹

¹University of Pisa. Division of Paleopathology, Bioethics and History of Medicine, Department of Oncology, Transplants and Advanced Technologies in Medicine, Pisa, Italy.

²University of Siena. Laboratory of Landscape Archaeology and Remote Sensing, Department of Archaeology and History of Arts, Siena, Italy.

³Second University of Naples. Isotope Research Center for Cultural and Environmental Heritage (CIRCE), Naples, Italy.

Poster

Lymph Node Tuberculosis with Diffuse Periosteal Reaction in Medieval Tuscany (11th-12th Century, Pieve di Pava, Siena)

Keywords: tuberculosis, lymph nodes, Middle Ages, Italy.

During the 6th archaeological excavation at the “Pieve di Pava”, an important medieval church near San Giovanni d’Asso (Siena, Tuscany) in the summer of 2009, the skeletal remains of a young female of 20-25 years, were discovered. Stable isotope analysis (¹⁸O) revealed that she was a member of the local population and that she had consumed a mixed diet, rich in animal proteins (¹³C: -19,5; ¹⁵N: 9,3).

In the thoracic cavity, near to the vertebral bodies, a number of small calcified smooth surface, but multilobular, calcified nodules, ranging in size from 1.5 x 0.8 x 0.7 to 0.4 cm, were found. In the case of larger formations is evident the confluence

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of more nodules with each other, sometimes around elongated structures. These nodules, most probably calcified peribronchial lymph nodes, were analyzed in the course of the project “Biomolecular archaeology of tuberculosis in Britain and Europe 2007-2011” (Durham and Manchester Universities) and resulted of “probable and possible tubercular origin” (C. Roberts 2010, personal communication).

Furthermore, the long bone diaphyses of almost the entire skeleton are coated with a thin layer of fiber bone, from 0.2 to 0.5 mm in thickness, forming a picture of diffuse periostitis, possibly related to lymph node tuberculosis.

Mountrakis C., Chovalopoulou M.E. and Michail D.

Department of Animal & Human Physiology, Faculty of Biology, National and Kapodistrian University of Athens.

Poster

Musculoskeletal stress of the upper limb in a Mycenaean era population of Athens

Keywords: *Musculoskeletal stress, upper limb, Bronze Age, Greece.*

Musculoskeletal stress markers (MSMs) are frequently studied by bioarchaeologists in order to ascertain the behavioral trends of past populations, as they are useful tools through which to interpret the daily activity patterns of individuals within a population. It is generally accepted that habitual and/or high levels of stress result in the modification of bone morphology in the form of non-pathological new bone formation and/or lesions, depending on the insertion type. The current study examines possible variation of musculoskeletal stress of the upper limb bones of males and females in the Mycenaean era burials of the Athens Agora archaeological site. Thirty-four adult individuals, 18 males and 16 females, met assessment criteria and are included in the study. These individuals were visually assessed on 35 entheses of the bones of the left and right upper limb, including the scapula and the clavicle. Ranking analysis indicates that there is no significant difference in degree of MSM expression between the sexes, however there is a difference in which areas the higher scores are expressed. Statistical analysis indicates that there are significant differences of MSM score distribution between males and females for only 1 of the 35 sites, the conoid ligament attachment (clavicle), which displays higher levels of stress in females, and is associated with abduction of the arm and the limiting of anterior motion of the scapula. Statistical analysis of attachments pooled by bone reveals significant differences of MSM score distribution for the clavicle alone. Considering the

studied sample representative of the wider population, the results indicate no significant variation of the level of stress exerted upon the upper limb between sexes in Mycenaean Athens, an assumption complying with historical and archaeological knowledge on the division of labor between sexes in Mycenaean era settlements.

Mowlavi G.¹, Kacki S.^{2,3}, Mobedi I.¹, Shahbazi F.¹, Makki M.S.¹ and Nezamabadi M.^{1,4}

¹Department of Medical Parasitology & Mycology, School of Public Health, Tehran University of Medical Sciences, P.O. Box 6446, Tehran 14155, Iran.

²Inrap, ZI de la Pilaterie, 11 rue des Champs, 59650 Villeneuve d'Ascq, France.

³PACEA, UMR 5199, Anthropologie des Populations Passées et Présentes, bâtiment B8, avenue des Facultés, 33405 Talence cedex, France.

⁴UMR 6249 – Chrono-environnement, Université de Franche-Comté, 16 route de Gray, 25032 Besançon cedex, France.

Poster

Trichuridae eggs revealed from a late Roman grave (Amiens, Northern France): A preliminary report

Keywords: *paleoparasitology, parasite eggs, Trichuridae, calcified cyst.*

This paper reports the primary findings of an interdisciplinary study of two cyst-shape calcified objects. The investigated material has been recovered from the grave of an adolescent individual, buried in a small French necropolis archaeologically dated to the late Roman period (3rd-5th century AD). Those hollow spherical objects, which measured several centimetres across and were partly filled with a powdery substance, were initially located in the thoracoabdominal section of the body. In order to determine their aetiology, the cyst-shaped objects and the filling powder were investigated, aiming to find any parasites. Several methods were applied, including crystallography, element analysis, routine palaeoparasitological examination with rehydration technique, and histological analysis.

The results clearly point out the organic origin of those two calcified objects. Preliminary microscopic studies did not show any parasite particles when a standard rehydration method was performed. In contrast, use of resin embedding protocol, which has been practiced here as a palaeoparasitological technique for the first time, has enabled us to observe parasite eggs in thin sections of calcified material. Based upon apparent features of the eggs detected on the slides and their assumed location in the cadaver, they can be confidently attributed to the *Trichuridae* species. At this level, our findings cannot evidently point out

hydatidosis, as were firstly hypothesized on the basis of gross morphology of the calcified objects.

Muja C.^{1,2,3}, Dinischiotu A.¹ and. Guillot P.³

¹Faculty of Biology, University of Bucharest, Bucharest, Romania.

²Institute of Archaeology "Vasile Pârvan", Bucharest, Romania.

³CUFR "J.F. Champollion", Albi, France.

Poster

A Case of Metastatic Carcinoma from 12th – 13th Century Transylvania, Romania

Keywords: *Metastatic cancer, Middle Ages, Feldioara, Romania.*

The human skeletal remains analyzed in this study come from the medieval cemetery of Feldioara, Romania (XIIth – XIIIth century). A total number of 144 individuals were identified in the 124 graves excavated in several field periods between 1992 and 2007. In this presentation the characteristics of osteolytic lesions, identified in a skeleton of a 30–34 years old female, are discussed. All the skeletal elements available for analysis were subject to careful macroscopic and radiologic evaluation. Numerous lesions with various shapes were present in both cranial and post-cranial skeleton. The skull, the vertebral column, the ribs, the upper griddle bones, the hip bones and the proximal epiphysis of humeri and femora displayed multiple lesions with dimensions ranging between 2 mm and 25 mm. Some of them were visible only by radiological examination. Similar lytic foci were also present in the proximal portion of the right radius. At the same time, several lesions showed the presence of osteoblastic reaction. All the characteristics of the pathological changes, except the presence of the lesions in radius, are indicative of a metastatic carcinoma. In the differential diagnosis between metastatic carcinoma and multiple myeloma, the presence of the osteoblastic response in some of the lesions and their variable dimensions and shapes ruled out the latter as possible cause. While a precise diagnosis of the primary lesion is not possible, the characteristics of the lesions as well as the age and sex of the individual suggest that the metastatic carcinoma originated from a breast cancer. Nevertheless, other types of tumors such as pulmonary cancer cannot be excluded.

Myeung Ju Kim¹, Yi-Suk Kim², Chang Seok Oh^{3,4}, Sun Sook Han³, Deog Kyeom Kim⁵ and Dong Hoon Shin^{3,4}

¹Dept. of Anatomy, Dankook University College of Medicine, Cheonan, 330-714, Korea.

²Dept. of Anatomy, Ewha Womans University School of Medicine, 911-1, Mok-6-Dong, Yangcheon-gu, Seoul 158-710, Korea.

³Dept. of Anatomy, Seoul National University College of Medicine, 28, Yongon-dong, Chongno-gu, Seoul 110-799, Korea.

⁴Institute of Forensic Medicine, Seoul National University College of Medicine, 28, Yongon-dong, Chongno-gu, Seoul 110-799, Korea.

⁵Department of Internal Medicine, Seoul National University Boramae Hospital, Seoul, Korea.

Poster

Paleopathological Studies on Joseon Dynasty Human Sample Collection in Korea

Keywords: *Human bone, Diffuse Idiopathic Skeletal Hyperostosis (DISH), Rheumatoid arthritis (RA), Joseon Dynasty Human Sample Collection (JDHSC), Korea.*

Most of archeological studies on diseases of bone were successfully performed in Egyptian, African, European skeletal collections until now. Morphological investigations for changes in skeletons have been able to apply widely and provide the characteristic features suggesting degenerative changes, inflammatory condition, infectious condition, and traumatic injuries in ancient or medieval human bones. Since well-preserved human skeleton collection is also essential for anthropologists to study paleopathology, 15th-19th century human skeletons from pre-modern Korean tombs were collected and maintained in Joseon Dynasty Human Sample Collection (JDHSC). Among various paleopathological cases in the collection, we presented Diffuse Idiopathic Skeletal Hyperostosis (DISH), Rheumatoid Arthritis (RA), dental caries, traumatic injuries and degenerative changes in the bones. To identify the presence of diseases much clearly, radiological investigations (e.g. computed tomography) were also performed on our cases. Our report could show the disease patterns affecting the pre-modern Korean people even though further studies are still needed for the same cases in the forthcoming days. This study was achieved with the support of national R&D project hosted by National Research Institute of Cultural Heritage of Cultural Heritage Administration (NRICH-1207-B04F).

Myszka A., Krenz-Niedbała M., Miłosz E. and Piontek J.

Adam Mickiewicz University in Poznan, Faculty of Biology, Institute of Anthropology, Department of Human Evolutionary Biology, Umultowska 89, 61-614 Poznan, Poland.

Poster

Traumatic injuries in the Late Medieval and

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Early Modern population from Łekno, Poland

Keywords: *traumatic injuries, medieval populations, Poland.*

The aim of this study was to document the traumatic injuries in the late medieval and early modern population from Łekno, Poland (13th – 16th centuries AD). The skeletons of 247 individuals (147 males; 81 females; 19 unsexed) were studied.

The results obtained for the Łekno population were compared with frequencies of traumatic injuries in a selection of medieval populations from Poland: Cedyňa, Złota Pińczowska, Słaboszewo, Doktorce (rural populations), Czersk, Toruń (urban populations). The material from Łekno was also compared with the early medieval Slavonic population from Pohansko u Břeclavi, Czech Republic (urban population) (Kanašová et al. 2009), a medieval rural population from Croatia (Novak 2011) and a late medieval–early modern agricultural population from Serbia (Djurić et al. 2006).

The frequency of traumatic injuries in the population from Łekno was 12.1%. Males tended to have more evidence of trauma (15.6%) than females (8.6%), but this was statistically not significant. In both sex groups the highest frequency of injuries was observed in the upper extremities. The bones most frequently involved in trauma were the clavicle and ulna, followed by the tibia and fibula. In females, the injuries were slightly more frequent in the bones from the left side of the skeleton. In males the frequency of trauma was significantly higher in the bones from the right side of the skeleton. With regard to the frequency of injuries, the Łekno population did not differ from the populations from Doktorce (14.0%), Słaboszewo (13.2%) and Toruń (8.3%), but it did differ from populations from Czersk, (4.3%), Cedyňa (4.2%) and Złota Pińczowska (3.4%). The Łekno population (1.64%) did not differ from the Czech Republic (1.39%) and Croatia (1.9%) populations.

The obtained results suggest that the analyses of traumatic injuries in skeletal populations are not a sufficient source of information on health, occupation or biological condition of individuals and populations.

Nerlich A.G.¹, Lalremruata A.², Ball M.³, Bianucci R.^{4,5}, Khairat R.³, Kun J.² and Pusch C.M.³

¹Division of Paleopathology, Institute of Pathology, Academic Clinic München-Bogenhausen, Englschalkingerstr. 77, D- 81925 München, Germany.

²Institut für Tropenmedizin, University of Tübingen, Wilhelmstraße 27, 72074 Tübingen, Germany.

³Institute of Human Genetics, University of Tübingen,

Wilhelmstraße 27, 72074 Tübingen, Germany.

⁴Division of Paleopathology, History of Medicine and Bioethics, Department of Oncology, Transplants and Advanced Technologies in Medicine, University of Pisa, Via Roma 57, 56126 Pisa, Italy.

⁵Laboratory of Criminalistic Sciences, Department of Anatomy, Pharmacology and Legal Medicine, University of Turin, C.so Galileo Galilei, 22, Turin, Italy.

Podium

Molecular identification of infectious pathogens from ancient egyptians mummies: co-infections with tuberculosis and malaria

Keywords: *Paleomicrobiology, MTB complex, malaria tropica, Ancient Egypt, Abusir el Meleq, Fayum Valley, Late to Graeco-Roman.*

Molecular identification of human tuberculosis and malaria tropica infections in ancient Egyptian mummified heads from the Fayum Valley, Lower Egypt are described. The mummies were recovered from the necropolis of Abusir el Meleq at the end of the 19th century and date from 806 BC to 124 AD (Late to Graeco-Roman Period).

Soft tissue biopsies from 16 mummies were used for DNA extractions and PCR amplifications. A 123 bp fragment of the *Mycobacterium tuberculosis* complex insertion sequence IS6110 was detected in three of sixteen samples. Furthermore, five of the 16 biopsies showed positive amplification for the *Plasmodium falciparum* apical membrane antigen 1 (AMA1) gene. Concomitant PCR amplification of *M. tuberculosis* complex and *P. falciparum* aDNA specific fragments was obtained in three mummies thus providing evidence for the presence of tuberculosis and malaria tropica co-infections in these ancient people from Lower Egypt.

These data confirm, using modern methods, the 19th and 20th century reputation of the Fayum (a large depression sixty kilometers south- west of modern Cairo) as another malarial region outside the northern Nile Delta.

Neves M.J.¹, Ferreira M.T.² and Wasterlain S.N.³

¹Centro de Investigação em Antropologia e Saúde, iDryas-GAPlab, Grupo Dryas Octopetala, Rua Aníbal de Lima, 170, 3000-030 Coimbra, Portugal.

²Forensic Sciences Centre, iDryas-GAPlab, Grupo Dryas Octopetala, Rua Aníbal de Lima, 170, 3000-030 Coimbra, Portugal.

³Centro de Investigação em Antropologia e Saúde, Department of Life Sciences, University of Coimbra, Coimbra 3001-401, Portugal.

Poster

Lagos leproarium (Portugal): direct and

indirect evidence of disease

Keywords: *Leprosarium, leprosy, osteomyelitis, brucellosis, Legg-Calvé-Perthes disease.*

In 2009, an archaeological intervention in the Valle da Gafaria (Lagos, Portugal) allowed the excavation of part of a leprosarium (15th-17th centuries). During the excavation a necropolis area was identified. Although it was detached from the hospital, the contextual, archaeoanatomical, and bioanthropological characterization of the burials allowed us to associate the exhumed individuals to the leprosarium. The individuals recovered were buried directly in the soil, in positions and orientations discordant to the prevailing Christian rules. The sample was made up of eleven adult individuals of both sexes.

This communication discusses the differential diagnosis of unusual and distinct pathological changes in ten of the individuals recovered. The differential diagnosis of the lesions gave rise to several possible pathological conditions, namely: leprosy, tuberculosis, treponematoses, osteomyelitis, brucellosis, smallpox and mycosis. Various macroscopic aspects led us to consider leprosy as the most probable diagnosis for at least two individuals. Treponematoses and brucellosis were the probable diagnosis in two other individuals. In six individuals, the observed lesions were not pathognomonic of any disease, therefore preventing any conclusive diagnosis. Yet, one of these last individuals presented lesions in the right femur compatible with Legg-Calvé-Perthes disease.

The present study adds to the only case of leprosy detected in non-identified Portuguese human skeletal remains until now, and adds to the few paleopathological studies available for leprosy in the osteoarchaeological literature.

Nezamabadi M.¹, Aali A.², Stöllner T.³ and Le Bailly M.¹

¹University of Franche-Comte, CNRS UMR 6249 Chrono-Environnement, 16, Route de Gray, 25030 Besançon cedex, France.

²Archaeological Museum of Zanjan, Emaarate Zolfaghari, Taleghani st., Zanjan, Iran.

³Fakultät für Geschichtswissenschaften, Ruhr Universität Bochum, Institut für Archäologische Wissenschaften, Am Bergbaumuseum 31, D-44791 Bochum & Deutsches Bergbau-Museum, Herner Straße 45, D-44787 Bochum, Germany.

Podium

A paleoparasitological study of the ancient salt miners in Chehrabad (Northwestern Iran)

Keywords: *Paleoparasitology, Helminths, Mummies,*

Salt mine, Iran.

During the two past decades, bioarchaeologists analyzed ancient workers in the salt mine of Chehrabad, northwestern Iran. Five natural mummies presenting an extraordinary state of preservation offers us the possibility to perform paleoparasitological analyses. Parasite extraction led to the recovery of *Taenia* sp. eggs in mummy #5, and proved ancient parasitism in the salt mine area at least since the fifth century BCE (Achaemenid period). More recently, other tests of soil samples containing or linked with coprolites from the salt mine allowed us to recover a large variety of human and animal parasites. Eggs of *Trichuris* sp., *Ascaris* sp., *Taenia/Echinococcus* sp., *Dicrocoelium* sp., *Oxyuris equi* and *Enterobius vermicularis* were found. This study is the beginning of our ancient parasite knowledge for Iran. It brings additional information about the ancient miner way of life, concerning health, paleopathology, sanitary conditions, human and/or animal parasite infections during mining activities, as well as diet of ancient workers.

Nicklisch N.¹, Maixner F.², Siebert A.¹, Ganslmeier R.³, Friederich S.³, Zink A.² and Alt K.W.¹

¹Institute of Anthropology, Johannes Gutenberg University Mainz, Germany.

²Institute for Mummies and the Iceman, EURAC research, Viale Druso 1, I-39100 Bolzano, Italy.

³State Office for Heritage Management and Archaeology, Saxony-Anhalt/State Museum of Prehistory, Richard-Wagner-Str. 9, 06114 Halle/Saale, Germany.

Podium

Rib lesions in Neolithic and Early Bronze Age populations from Central Germany – Indications for a diachronic change in the health status?

Keywords: *rib lesions, pulmonary diseases, dietary changes, Neolithic, Early Bronze Age.*

About 600 burials from sites in Saxony-Anhalt, Germany, dating from the Neolithic (n=407) and Early Bronze Age (n=191) were morphologically and metrically analysed. Individuals from almost all sites exhibited periosteal reactions on the visceral rib surface of differing frequency and expression. In the Early Neolithic assemblages, the lesions (14%) were much more severe with distinctive new bone formation, particularly at the vertebral end. The affected individuals were predominantly adults but also some children displayed characteristic features. The histological analysis of the rib lesions pointed to chronic inflammatory processes. In addition, the presence of *M. tuberculosis* complex DNA was detected

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by molecular techniques. In all, the probability is high that the lesions are related to tuberculosis (TB) and that pulmonary TB was not uncommon in Early Neolithic populations from this region.

In skeletons dating to Middle (MN) and Late Neolithic (LN) the frequency of rib lesions with new bone layers decreased (MN 4%; LN 7%) followed by a further increase in the Early Bronze Age (EBA) assemblage (18%). Moreover, in the LN and EBA burials the repertoire of rib lesions was supplemented by nodular like bone reactions, that rather implied a healed inflammatory process. Various interpretations are possible such as, that variation in rib pathology indicated an adaptation of the immune response or even that the virulence of the pathogen may have changed. Nevertheless, it is possible that the altered rib lesions were the expression of different pathogens or that they were induced by a kind of mechanical stressor.

Further analyses on unspecific stress markers, dental diseases and osteometrical features combined with results of the carbon and nitrogen isotopic analyses aimed to help clarify whether a diachronic change in health status during the Neolithic to the Early Bronze Age might be observed and if the emergence of rib lesions was related.

Novotny F.¹, Ramsel P.C.² and Teschler-Nicola M.^{3,4}

¹Preh. Commission, Austrian Academy of Science c/o Department of Anthropology, Natural History Museum, Vienna.

²Preh. Commission, Austrian Academy of Science c/o Department of Prehistory, Natural History Museum, Vienna.

³Department of Anthropology, Natural History Museum, Vienna.

⁴Department of Anthropology, University of Vienna.

Poster

Celtic identities: Living conditions, social differences and biological relations in Celtic societies in the Traisen-Valley (Lower Austria)

Keywords: *celtic populations, living conditions, demographic parameters, health status, trauma.*

The Traisen-valley with its cemeteries and settlements covering all chronological periods between the Neolithic and modern times is one of the most important and best investigated archaeological regions in central Europe. It is also outstanding due to the fact that most of the prehistoric periods are represented by several settlements and grave cemeteries enabling an assessment of living conditions to be made, along with and interpretation of possible social differences and biological relations in a particular geographic area and time period (Neugebauer, 1992; Teschler-Nicola, 1992).

This study focuses on three contemporary sites, Ossarn, Oberndorf and Pottenbrunn (dated from Hallstatt D3 to La Tène B2 – 530-250 BC); a total of 113 individuals are the subject of study (Gerold, 2002). The populations lived in close proximity at the west and east side of the river Traisen which had similar climates. Demographic profiles were constructed, and the presence of trauma, non-specific stress markers (enamel hypoplasia, cribra orbitalia, porotic hyperostosis, and periostitis on long bones) and infectious diseases were assessed using macroscopic inspection, radiography and histology.

Significant differences between the three populations were observed, in particular regarding the type and frequencies of infectious diseases, which were more frequent in Ossarn and Oberndorf than in Pottenbrunn. The possible reasons for this observation, for example social differences, are discussed by correlating the biological information with archaeological data such as grave structure and grave goods. This research contributes to the question of “Celtic identities”.

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Nowakowski D., Kwiatkowska B. and Szczurowski J.

Department of Anthropology, Wrocław University of Environmental and Life Sciences, ul. Kozuchowska 6, 51-631 Wrocław, Poland.

Poster

The skeleton of a female dwarf dated to 19th century from Wrocław, Poland

Keywords: *achondroplasia, hip dysplasia, enamel*

hypoplasia, Harris lines, skeleton, 19th century, Wroclaw, Poland.

Skeletons of people with dwarfism have been found in many archeological sites around the world, and dwarfism is a subject of scientific debate. Here the skeleton of an adult female dwarf is described which was found in a 19th century cemetery in Wroclaw, Poland.

It is likely that it is the skeleton derives from a postmortem examination in the first Wroclaw Department of Pathology. The individual's height was estimated at 130-135 cm. Detailed morphological analysis and morphometric measurements, together with radiological and histological analysis, suggest a diagnosis of achondroplasia. The dentition showed signs of early-stage dental caries and calculus. Additionally, the analysis of the cranium revealed nasal septum deviation and left concha bullosa. Changes detected on the L1 vertebra resulted from the existence of a lumbar rib. Extensive bone changes in the knee joints were found that most likely resulted from cruciate ligament injuries. Significant of bone tissue remodeling is evident in the bones of the knee joints. The above mentioned anomalies, as well as left hip joint dysplasia, could have significantly impaired the individual's movement. Additionally, the skeleton showed signs of physiological stress during development (enamel hypoplasia and Harris lines).

Long bones anomalies together with other features are discussed with regard to their influence on the everyday life of this person, which may also explain why this individual became the subject of post mortem examination in the first Department of Pathology in Wroclaw.

Öhrström L.¹, Bitzer A.², Walther M.², Fischer B.³ and Rühli F.J.¹

¹Swiss Mummy Project, Centre for Evolutionary Medicine, Institute of Anatomy, University of Zurich, Switzerland.

²Department of Molecular and Optical Physics, Albert-Ludwigs-University, Freiburg im Breisgau, Germany.

³French-German Research Institute of St. Louis, France.

Poster

Terahertz imaging modalities of ancient Egyptian mummified objects

Keywords: *paleopathology, mummy, diagnostic imaging, Terahertz, X-Ray.*

Ancient mummies are of immense value as their examination provides insight into the evolution of disease and former living conditions. Non-invasive imaging modalities are desirable, as their physical

integrity should be guaranteed. Currently X-ray and computed tomography are the gold-standard imaging methods in mummy research. The use of THz imaging in cultural science is already established in studies of art and cultural objects.

The feasibility of Terahertz imaging in mummies was demonstrated just recently. As a low energetic radiation, which has been proved to be non-ionizing it is harmless to human cells. In addition THz imaging provides spectroscopic information of amplitude, phase and polarization in a broad frequency range (50 GHz - 3 THz), where diverse chemical substances can potentially be identified by their characteristic absorption behaviour.

Ancient Egyptian mummified objects (two artificially embalmed human hands and one artificially embalmed and wrapped human foot, belonging to different individuals, ex-collection Musée d'Orbe, Switzerland, ca. 1500 -1100 BCE) were investigated by two different THz imaging techniques. A broadband THz time domain spectroscopy system as well as an electronically based THz scanning device was used. Additionally the obtained results were compared to conventional CT, X-Ray and MR images.

The results show the potential of Terahertz imaging specifically for mummies. Mummy tissue and bone discrimination was feasible. Unlike in X-ray CT or MRI - THz imaging allows gaining multiple images of the same object with different frequencies as well as time-dependent images. However the resolution and penetration depth remained problematic. In order to its high spatial resolution CT imaging is clearly superior to THz. However THz imaging could be interesting for the application in museums or at excavation sites, as commercial mobile THz scanners are available. Furthermore its use is absolutely safe for the investigator.

Paja L.^{1,2,3}, Coqueugniot H.^{4,5}, Palkó A.⁶, Dutour O.^{3,7} and Pálfi G.¹

¹Department of Biological Anthropology, Faculty of Science and Informatics, University of Szeged, Szeged, Hungary.

²National Heritage Protection Centre, Hungarian National Museum, Szeged, Hungary.

³Laboratoire de Paléanthropologie de l'EPHE, École Pratique des Hautes Études, Talence, France.

⁴UMR 5199 – PACEA, Talence, France.

⁵Department of Human Evolution, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany.

⁶Department of Radiology, University of Szeged, Szeged, Hungary.

⁷Department of Anthropology, University of Toronto, Toronto,

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Canada.

Podium

Ankyloses of the spine in Hungarian skeletal series – characteristics and differential diagnosis

Osseous ankylosis resulting in complete loss of movement can develop in any segment of the spine. It can develop between any anatomical parts of the vertebrae; spaces between the vertebral bodies, zygapophyseal gaps and areas between the vertebral arches can also be involved. Several different conditions may cause osseous fusion. Fibrous adhesions and later osseous fusion may form as a result of immobilization following a traumatic event. Bony ankylosis of the spine has been associated with segmentation failure, diffuse idiopathic skeletal hyperostosis or seronegative arthropathies (e.g. ankylosing spondylitis). Infection is also a potential cause that may lead to the bony ankylosis of joints if it remains untreated. In infectious cases the responsible pathogens can be diverse, and are most often a bacterium species. Osseous changes can mimic each other in cases with different etiology; differentiation of the underlying cause can be difficult.

Our study illustrates a systematic analysis of spinal ankyloses originating from Hungarian skeletal series. We present how macromorphological analysis and medical imaging techniques (X-ray, CT, 2D and 3D reconstructions) were successfully interpreted to diagnose different diseases in osteoarcheological specimens.

The support of the Hungarian Scientific Research Found, OTKA NN 78555 is greatly acknowledged.

Paja L.^{1,2,3}, Dutour O.^{3,4} and Pálfi G.¹

¹Department of Biological Anthropology, Faculty of Science and Informatics, University of Szeged, Szeged, Hungary.

²National Heritage Protection Centre, Hungarian National Museum, Szeged, Hungary.

³Laboratoire de Paléanthropologie de l'EPHE, École Pratique des Hautes Études, Talence, France.

⁴Department of Anthropology, University of Toronto, Toronto, Canada.

Poster

Probable cases of skeletal tuberculosis in the osteoarcheological series of Horvát tranzit 40 (Hungary) – case report

Tuberculosis is a well known disease in the antiquity of the Great Hungarian Plain (Hungary), signs of osteoarticular tuberculosis are found in almost all archeological periods from Neolithic era to Late

Medieval times. The Sarmatians are one of the most characteristic people of the Great Hungarian Plain between the 1st and 5th centuries AD, but concerning skeletal TB in their findings only one case of lumbosacral tuberculosis was published.

Our study presents anthropological analysis of the archeological site Horvát tranzit 40, where Late-Sarmatian (4th century AD) and Late-Avar (8-9th century AD) objects were dug out. Among Sarmatian objects a small cemetery was also excavated. As a result of the anthropological examinations 17 individuals' skeletal remains were identified.

In the majority of the skeleton – although the fragmentary state of preservation caused some uncertainty during the examination – lesions associated with some infectious process can be seen. Tuberculosis as an underlying disease seems to be a probable etiology in two cases. Pott's gibbus, a pathognomonic sign of skeletal tuberculosis is not found on the bones, lytic lesions of lumbar vertebral bodies and newly formed periosteal bony appositions (ribs, long bones) refer to the presence of tuberculosis.

The support of the Hungarian Scientific Research Found, OTKA NN 78555 is greatly acknowledged.

Pálfi G.¹, Pap I.², Pósa A.¹, Bereczki Z.¹, Molnár E.¹, Dutour O.³, Perrin P.⁴, Tillier A.-M.⁵, Maixner F.⁶ and Zink A.⁶

¹Department of Biological Anthropology, University of Szeged, Szeged, Hungary.

²Department of Anthropology, Hungarian Natural History Museum, Budapest, Hungary.

³Laboratoire de Paléanthropologie EPHE (Ecole Pratique des Hautes Etudes), UMR 5199 PACEA, Université Bordeaux 1, Talence, France and Department of Anthropology, University of Toronto, Canada.

⁴Unité de Recherche MIVEGEC - UR 224/IRD - UMR 5290/CNRS - UMI - Université Montpellier 2, Montpellier, France.

⁵Laboratoire d'Anthropologie des Populations du Passé (LAPP - UMR 5199 du CNRS), Université Bordeaux 1, Talence, France.

⁶Institute for Mummies and the Iceman, EURAC Research, Bolzano, Italy.

Podium

Tuberculosis in a late medieval osteoarcheological series and in two paleolithic specimens from Hungary: morphological and paleomicrobial results

During the last century, paleopathology provided considerable amount of data about the past of human tuberculosis. These researches became more efficient during the last two decades, putting together the

capacities of the morphological and molecular diagnostics of the disease. However, in spite of all progresses and the intensive research programs developed during the last years, our knowledge on the evolution and paleoepidemiology of TB is still rather incomplete: a large number of parallel interdisciplinary projects would be necessary in order to clarify the past of the disease. With this in mind we recently started a Hungarian-Italian-French research program – applying both macroscopic and biomolecular studies of ancient human material –, hoping that our findings will be useful for the success of this important scientific venture. We would like to present here some of the preliminary results of this cooperation.

As the first step of our project, skeletal material of 205 17th century AD individuals (Bácsalmás, Hungary) was chosen for a macromorphological test-investigation, which was focused both on classical/advanced stage skeletal TB alterations (tuberculous spondylitis, tuberculous arthritis) and atypical/early-stage TB lesions (rib lesions, superficial vertebral changes, endocranial alterations, early-stage spondylodiscitis). Paleomicrobial analysis was used to study the presence of *Mycobacterium tuberculosis* complex ancient DNA both in morphologically positive and negative cases. A comparative paleomicrobial analysis was carried out on different parallel samples, in order to test the state of MTB DNA preservation in different skeletal locations. The PCR results confirmed the *M. tuberculosis* complex infection in half of the samples selected for this pilot project. We have no clear evidence for modern *M. tuberculosis* strains in the series, spoligotyping points towards *M. bovis* (or “ancient” *M. tuberculosis* strains), but further analysis are required to test for *M. bovis* specific regions.

In parallel with the study of the relatively recent (17th century AD) material, we tested the remains of two very ancient cases. The skeletal material of 2 Middle Paleolithic (cc. 50-30 thousand year BP) Neanderthal specimens (Subalyuk cave, Hungary), in which our preliminary morphological studies revealed the traces of potential TB infection, was subjected to paleomicrobial analysis. The preliminary molecular biological studies seem to prove the morphological observations: we have amplified a fragment of the IS6110 element and partial spoligotyping results. Sequencing of the IS6110 region provided clear results and confirmed the presence of *M. tuberculosis* DNA in both Neanderthal specimens. However, some more genotyping analysis and confirmation studies still have to be done.

This research was supported by the OTKA Grants 78555, NN78696, by the SROP 4.2.1./B-09-1/KNOV-210-0005, and the CNRS «MIE» program.

Palmer J.L.A., Hoogland M.H.L. and Waters-Rist A.L.
Faculty of Archaeology, Leiden University, The Netherlands.

Poster

Busy Bones: Osteoarthritis and musculoskeletal markers as evidence of physical stress in a rural Dutch community

Keywords: *Osteoarthritis, musculoskeletal stress markers, activity, Netherlands, post-Medieval.*

Osteoarthritis is a complex pathology with a multifactorial aetiology. One important aetiological factor is physical activity. In this study, osteoarthritic data are combined with data on musculoskeletal stress markers (MSM's) to establish the degree and pattern of potential physical stress that individuals experienced in the upper limb. The skeletal sample of 48 individuals stems from the nineteenth century Dutch cemetery of Middenbeemster, a new collection excavated by Leiden University in 2011. The results show that this agricultural community appeared to be engaged in generally strenuous physical labour, more so than that seen in contemporary Dutch settlements (e.g. in the urban context of Alkmaar in the 18th and early 19th century, elbow OA prevalence was 5% compared to 12,5% in Middenbeemster). This high physical stress is supported by the lack of pronounced handedness for both OA and MSMs. Osteoarthritis prevalence is high and, surprisingly, does not increase with age, staying the same in late young adults (26-35 years) and middle adults (36-49 years). Even so, many individuals survived well into older adulthood. This suggests that osteoarthritis does not necessarily signify poor health, or advanced age or degeneration, and that it must be appreciated as more than a note in the pathology section of an osteobiographical analysis. MSMs were positively correlated with age. Although the osteoarthritis data are not correlated with sex, the MSM data suggest that men and women may have engaged in different activities, with men having more pronounced muscle attachments at all sites except at triceps brachii. This study illustrates how pathological conditions should be analyzed beyond diagnosis and recording, to establish, insofar as is possible, how and why they occurred. Additional skeletal data (e.g. the MSM's) act as a control for the osteoarthritis data and help provide better insights into the lives of past individuals and populations.

Panagiotopoulou E.¹, Papathanasiou A.² and Mpeltsios K.³

¹Institute of Archaeology, University of Groningen, Netherlands.

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²Ephorate of Paleoanthropology and Speleology of Southern Greece.

³Department of Materials Science, University of Ioannina, Greece.

Podium

Diet Reconstruction with Stable Isotope Analysis of Human Skeletal Remains of the Early, Iron Age site, Agios Dimitrios in Central Greece

Keywords: *paleodiet, stable isotopic analysis, weaning, Early Iron Age, Geometric Greece.*

The Early Iron Age or Geometric period in Greece is an interesting yet relatively unexplored time period, both archaeologically and anthropologically. The research reported here focuses on the Geometric cemetery of Agios Dimitrios (850-740 B.C.), a site located in Central Greece, which yielded a human osteological sample, with a Minimum Number of Individuals (MNI) of 59, including equal numbers of adults and subadults, and of males and females. Analysis of these skeletal remains provides significant information on human health status while a paleodietary reconstruction based on the stable carbon and nitrogen isotope analysis of human bone collagen provides insight to the diet, subsistence strategy, and economy of this community.

The human isotopic values from Agios Dimitrios (adults $\delta^{13}\text{C} = -19.72\text{‰} \pm 0.35\text{‰}$ and $\delta^{15}\text{N} = 8.28\text{‰} \pm 0.89\text{‰}$, infants $\delta^{13}\text{C} = -19.40\text{‰} \pm 0.48\text{‰}$ and $\delta^{15}\text{N} = 9.81\text{‰} \pm 1.1\text{‰}$, fauna $\delta^{13}\text{C} = -19.85\text{‰} \pm 1.44\text{‰}$ and $\delta^{15}\text{N} = 6.00\text{‰} \pm 1\text{‰}$) clearly represent a predominantly terrestrial C_3 diet with a minor animal protein component. Marine protein was not incorporated in substantial quantities in the diet, although Agios Dimitrios is a coastal site, and the same conclusion can be reached for C_4 derived protein.

Intra-population analysis of the Agios Dimitrios sample revealed that there was no statistically significant differentiation in terms of age, sex or social status, indicating equal access to all food categories for all members of the society. Finally, indications about the weaning age emerged, suggesting that supplementary food must have been introduced to the infants' diet between the ages of one and two years, although the sample size is very small.

Panhuysen R.

Amsterdam Archaeological Centre, University of Amsterdam.

Poster

Trauma in Early Medieval Dorestad, The Netherlands

From the second half of the seventh century to the first half of the ninth century Dorestad was an important hub in western European economy. It was linked to an exchange network connecting the south of Europe with the British Isles and Scandinavia. Extensive excavations at the site of Dorestad, situated in the present-day town of Wijk bij Duurstede in the Netherlands, have brought to light among others considerable numbers of burials. Despite the large scale fieldwork in the past fifty years many questions regarding the nature of the site remain.

Within the framework of a backlog programme focussing on the analysis of excavation data and finds of Dutch excavations from before the year 2000 one of the cemeteries of Dorestad is examined. Both the burial contexts and the human remains of the cemetery of "De Heul" are being studied to determine the nature of the population. Documented are 176 burial contexts, containing the remains of 222 individuals. This paper will focus on two types of trauma: fractures and trauma associated with violence (blunt force trauma and sharp bladed trauma). Fractures and fracture healing will be studied to learn more about the activities of the population buried at "De Heul" and the access to adequate treatment of fractures. According to several historical sources Dorestad fell victim to a series of Viking raids between 834 and 863 AD. The question whether the sharp bladed and blunt force trauma was related to these Viking raids will be discussed.

Panzer S.¹, Piombino-Mascali D.² and Zink A.R.²

¹Department of Radiology, Trauma Center Murnau, Murnau, Germany.

²EURAC - Institute for Mummies and the Iceman, Bolzano, Italy.

Poster

Herniation Pits in Human Mummies: A CT Investigation in the Capuchin Catacombs of Palermo, Sicily

Keywords: *Herniation pits, Paleoradiology, computed tomography, osteoarthritis, mummy.*

Herniation pits (HPs) of the femoral neck were first described as round to oval radiolucencies in the femoral neck on anteroposterior radiographs of adults. In early clinical publications, HPs were generally recognized as an incidental finding. In contrast, in current clinical literature they are mentioned in the context of femoroacetabular impingement (FAI) of the hip joint, which is known to cause osteoarthritis (OA). The significance of HPs in chronic skeletal disorders such as OA is still unclear, but they are discussed as a possible radiological indicator for FAI in a large part

of clinical studies. In this paleoradiological study we examined a sample of mummies from the Capuchin Catacombs of Palermo, Sicily, by a mobile computed tomography (CT) scanner. Evaluation of the CT examinations revealed HPs in six out of 16 (37.5%) adult male mummies. The first aim of this study was to compare the characteristics of HPs shown in our mummy collection to the findings described in clinical literature. Thereby CT evaluation revealed that their osseous imaging characteristics are in accordance, consisting of round to oval subcortical lesions at the anterior femoral neck, clearly demarcated by a sclerotic margin. The second aim was to introduce HPs to the paleoradiological and paleopathological methodology as an entity that underwent a renaissance from an incidental finding to a possible radiological indicator of FAI in the clinical situation. As FAI plays an important role in the development of OA of the hip, which is a very common finding in human skeletal remains, HPs should always be considered in paleoradiological evaluation of hip joint diseases.

Petersone-Gordina E.¹, Gerhards G.² and Jakob T.¹

¹Department of Archaeology, Durham University, UK.

²Institute of Latvian History, University of Latvia.

Poster

Normal bone growth versus abnormal new bone formation and porosities in non-adult individuals from post-medieval Jelgava, Latvia (17th – 18th c. CE)

Keywords: *neonate, infant, metabolic disease, non-specific infectious disease, trauma.*

This study addresses difficulties in distinguishing growth-related changes from abnormal periosteal reactions in skeletal remains of non-adults (neonates and infants up to one year of age). The problem was discovered when trying to find evidence for scurvy in a 17th-18th century German population from Jelgava, Latvia, as a part of a Master's dissertation project.

There were 28 non-adult individuals in this population, and 13 were approximately one year old or younger. All observable non-adult individuals were macroscopically observed for new bone formation and/or abnormal porosity on the skull, ribs and limb bones. Individuals below one year of age were divided into two age groups and a comparative analysis of the same skeletal elements was carried out between all individuals in the same age group.

While pathological changes were easily distinguishable in non-adult individuals above the age of one year due to the more compact bone structure, the

porous appearance and deposits of woven bone on the same skeletal elements in younger individuals made the analysis difficult. It was understood that the processes of bone apposition and remodelling during rapid growth could resemble pathological bone changes seen in metabolic disease, as well as non-specific infectious disease and trauma. Despite the comparative analysis the results were inconclusive.

The comparative process was hindered by the differential survival of the same skeletal elements in different individuals and the relatively small sample size. It was concluded that more research is necessary to improve our understanding of developmental bone apposition and porosity as opposed to the similar appearance of pathological changes in very young individuals. To resolve this problem, a new study is under way comparing the same skeletal elements in individuals of similar age from six different populations drawing on a larger sample of more than 100 individuals.

Piombino-Mascali D.¹, Panzer S.², Rosendahl W.³, Todesco M.S.⁴, Aufderheide A.C.⁵ and Zink A.R.¹

¹EURAC, Bolzano, Italy.

²Trauma Center Murnau, Germany.

³REM, Mannheim, Germany.

⁴Sicilian Region, Messina, Italy.

⁵Department of Pathology, University of Minnesota, Duluth, USA.

Podium

Paleoradiology of the Savoca Mummies, Messina, Sicily

Keywords: *mummies, Sicily, radiology, paleopathology, death.*

The huge number of mummified remains in the Italian region of Sicily represents a unique opportunity to assess life, lifestyle, health conditions and physical features of a considerable number of individuals from the Modern Era, contributing to improve our knowledge on a large section of local paleopopulations. Within the framework of the «Sicily Mummy Project», ongoing since 2007, we had the chance to carry out non-invasive radiological analyses on the renowned Savoca mummy collection, dating from the end of the 18th century and the late 19th century AD. This contribution will discuss the important results obtained, putting the paleopathological data into the historical and historicomedical context of Late Modern Sicily.

Piontek J. and Jerszyńska B.

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Adam Mickiewicz University in Poznan, Faculty of Biology, Institute of Anthropology, Department of Human Evolutionary Biology, Umultowska 89, 61-614 Poznan, Poland.

Poster

The frequencies of cribra orbitalia, humeral and femoral cribra in non-adult skeletons from a medieval cemetery of Cedynia, Poland

Keywords: *cribra orbitalia, humeral and femoral cribra, medieval cemetery, Poland.*

Among many skeletal indicators of the biological status of the prehistoric populations special importance is attributed to cribra orbitalia. Porotic lesions not only involve the orbital roof, but also occur in long bones. In the literature it is proposed to examine the incidence of humeral and/or (depending on the condition of the skeleton) femoral cribra, as useful markers of the health status of the individual.

The aim of this study is to compare the frequencies of non-specific stress indicators, cribra orbitalia and femoral and humeral cribra in non-adult skeletons from a medieval cemetery of Cedynia. The cemetery dates from the second half of the 12th century to the 14th century.

In total 211 skeletons were examined. 160 skeletons were qualified for scoring both cribra orbitalia and femoral cribra, 104 skeletons were used to assess cribra orbitalia, 90 skeletons to assess femoral cribra and 54 skeletons were included in the assessment of co-occurrence of femoral and humeral cribra.

Cribra orbitalia was scored according to the classification system of Robledo et al. (1995), and humeral and femoral cribra - using the Miquel-Feucht et al.'s grade system (1999).

The comparative analysis of the lesions showed the highest incidence of femoral cribra (90.0% of individuals), then cribra orbitalia (84.6%) and humeral cribra (59.3%). The frequencies of cribra orbitalia and femoral cribra are almost identical. The observed asymmetry of occurrence of cribra orbitalia, femoral and humeral cribra proved statistically insignificant.

The presented data show that the living conditions in a medieval population from Cedynia did not guarantee proper growth and development of children and juveniles. They were exposed to various factors affecting the course of progressive ontogeny, especially related to diseases. This conclusion is supported by the studies of skeletal growth profiles and Harris lines of the tibia (Piontek et al. 1993, Jerszyńska 2004).

Plomp K.A.^{1,2}, Roberts C.A.² and Strand Viðarsdóttir

U.^{1,3}

¹Evolutionary Anthropology Research Group, Department of Anthropology, Durham University, Dawson Building, South Road, Durham DH1 3LE, UK.

²Department of Archaeology, Durham University, Dawson Building, South Road, Durham DH1 3LE, UK.

³Biomedical Center, University of Iceland, Vatnsmýrarvegi 16, 101 Reykjavik, Iceland.

Poster

Quantifying Rhinomaxillary Syndrome using 3D Shape Analysis

Keywords: *leprosy, geometric morphometrics, lepromatous, palaeopathology.*

Rhinomaxillary syndrome or facies leprosa describes a group of lesions which is pathognomonic of lepromatous leprosy and is characterized by the erosive, resorptive and proliferative bone changes variously affecting the alveolar and palatine processes of the maxilla, the anterior nasal spine, the intranasal osseous structures, and the margins of the nasal aperture. The presence of these skeletal changes is used to indicate lepromatous leprosy in archaeological human remains, and is recorded in palaeopathological research by macroscopic description based on the skeletal changes visible. To quantify the facial shape change resulting from the infection, this study applied objective 3D shape analysis techniques to the lesions observed in 41 late medieval skeletons with leprosy from two English sites: St. James and Mary Magdalene, Chichester, Sussex and Hereford Cathedral, Herefordshire. The results indicate that the shape changes associated with the lesion are progressive and systematic. Individuals with rhinomaxillary changes are distinguished from healthy individuals with an accuracy of 85.4%, indicating that the shape changes associated with the disease deform the nasal aperture beyond that expected for normal human variation and that these changes can be statistically identified based on independent shape variables. Geometric morphometrics provide new methods of recording and describing palaeopathological lesions, which when used in conjunction with traditional macroscopic methods, can greatly strengthen palaeopathological research by providing objective and quantified data.

Plomp K.A.^{1,2}, Roberts C.A.² and Strand Viðarsdóttir U.^{1,3}

¹Evolutionary Anthropology Research Group, Department of Anthropology, Durham University, Dawson Building, South Road, Durham DH1 3LE, UK.

²Department of Archaeology, Durham University, Dawson Building, South Road, Durham DH1 3LE, UK.

³Biomedical Center, University of Iceland, Vatnsmýrarveggi 16, 101 Reykjavik, Iceland.

Podium

Vertebral Morphology an Aetiological Factor for Schmorl's Nodes at the Thoraco-Lumbar Junction and Lumbar Spine

Keywords: *disc herniation, geometric morphometrics, shape analysis, palaeopathology.*

Schmorl's nodes are the result of herniations of the nucleus pulposus into the adjacent vertebral body and are commonly identified in both clinical and archaeological contexts. The current study aims to identify aspects of vertebral shape that correlate with the presence of Schmorl's nodes. Two-dimensional statistical shape analysis was performed on digital images of the lower thoracic and lumbar spines of adult skeletons from the medieval (12th-16th C AD) skeletal assemblage of Fishergate House, York. Schmorl's nodes were scored on the basis of their location, depth, and size, with both healthy and affected vertebrae included in the analysis. Results indicate that there is a strong correlation between the shape of the neural foramen, pedicles, and vertebral body with the presence of Schmorl's nodes at the thoraco-lumbar junction and lumbar spine. The biomechanical significance of vertebral morphology is not fully understood, however, this study suggests that the pedicle shape identified on affected vertebrae may not provide adequate structural support for the larger vertebral bodies during compressive forces, resulting in disc herniation. The results indicate that vertebral morphology may be an important aetiological factor in intervertebral disc herniation, and the development of Schmorl's nodes.

Polet C.¹, Van Craynest M.-P.², Louryan S.³, Roels D.³ and Groenen M.³

¹Institut royal des Sciences naturelles de Belgique.

²New Labpatho, Braine-l'Alleud, Belgique.

³Université Libre de Bruxelles, Belgique.

Poster

Analysis of an Iron Age trepanned skull from the Tiène des Maulins rock shelter (Belgium)

Keywords: *Tiène des Maulins, trepanation, Iron Age, Hallstatt, Belgium.*

The Tiène des Maulins, a rock shelter in Eprave (Prov. of Namur, Belgium), was excavated by Bruno Marée between 1978 and 1984, and since 1999 by Marc Groenen (CREA-Patrimoine, Free University of Brussels). These excavations revealed four main periods of occupation: the oldest dating back to the Middle

Paleolithic, the second to the Upper Palaeolithic, the third to the Recent Neolithic and the latest being from the Protohistoric period (Iron Age).

From this latter period, only one fragmented skull belonging to an individual aged between 10 and 15 years was recovered. The skull showed a circular hole that was determined to be that of a trepanation (25 x 30 mm) crossing the right lambdoid suture. Radiocarbon analysis of this calvarium indicated 2430 ± 30 B.P. (KIA-252333), dating the skull between 400 and 750 BC.

Macroscopic and computed tomographic examinations could not suggest the reason for this surgical intervention but they revealed that the individual probably underwent a second trepanation in the same place as the first. Premature obliteration of the lambdoid suture on both sides of the hole and the evidence of healing on its lower edge indicate that this young individual survived for several months following the first operation. The second trepanation consisted of an expansion superiorly to the first hole. This trepanation hole has vertical and sharp edges, and was probably performed perimortem. This data suggest a recurring pathological process or a ritual post-mortem re-intervention.

Ponce P.¹, Menzel E.¹, Sibun L.¹, Waldron T.², Rando C.² and Hillson S.²

¹Archaeology South East, Institute of Archaeology, University College London, UK.

²Institute of Archaeology, University College London, UK.

Poster

A Belly of Bone: Investigation of an Unusual and Rare Bone Mass Found in a Post-Medieval Individual from Chichester, UK

Keywords: *Chichester, ossifying tumour, post-medieval, sarcoma.*

Skeleton 3786 was recovered from Eastgate Cemetery in Chichester, West Sussex (UK) during excavations by Archaeology South East, in 2011. The cemetery dates from the medieval and post-medieval periods, with skeleton 3786 dating to the cemetery's later years. This individual, a mature female, was found with a large bony mass within the pelvis. The mass is oval in shape, 24.3 x 19.0 x 16.4 cm in largest extent, and weighs 3.32 kg. The woman had rotator cuff disease affecting the right shoulder and established osteoporosis, with a number of compression fractures of the vertebrae and cortical thinning. Radiography and CT scanning showed that the mass contained a central void associated with dense metopic bone, a central less

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dense core and a dense shell. No mass of comparable size has previously been identified in archaeological material. Possible differential diagnoses include ossifying tumours arising from the uterus or ovaries. Further work is under way to identify the origins of the mass more exactly.

Premužić Z.¹, Rajić Šikanjić P.¹ and Mašić B.²

¹Institute for Anthropological Research, Gajeva 32, 10000 Zagreb, Croatia.

²Zagreb City Museum, Opatička 20, 10000 Zagreb, Croatia.

Poster

Foreign soldiers and syphilis in 16th century Zagreb

Keywords: *syphilis, Zagreb, Croatia, 16th century.*

Analysis of human skeletal remains from the 16th century archaeological site of Park Grič in Zagreb, Croatia discovered 6 cases of syphilis. Venereal syphilis was present in 5 adults of both sexes. Additionally, one case of congenital syphilis was observed in an adolescent. The documented cases represent the earliest appearance of this disease in Zagreb, occurring at roughly the same time as the outbreak of syphilis in Europe. In this period Zagreb area witnessed numerous conflicts resulting from civil war and Ottoman expansion. Foreign soldiers participating in these battles were stationed in the city itself and surrounding area. Described circumstances induced the spread of syphilis, initiated by soldiers, in the local population.

Pulcini M.L.¹, Cupitò M.¹, Salzani L.² and Canci C.¹

¹Dipartimento dei Beni Culturali: Archeologia, Storia dell'Arte, del Cinema e della Musica, Università degli Studi di Padova (Italy).

²Soprintendenza per i Beni Archeologici del Veneto (Italy).

Poster

Spondylolysis in Italian Prehistory. The Case of Olmo di Nogara (Verona, Northeast Italy)

Keywords: *Bronze Age, Northeast Italy, Spondylolysis, Paleopathology, Skeletal occupational markers.*

The necropolis of Olmo di Nogara, dating between the second half of the 16th century and the beginning of the 12th century BC (central phases of the Middle Bronze Age and early Late Bronze Age) is one of the most important pre-protohistoric burial sites that has come to light in Italy during recent years. The graveyard is located in the western Veneto plain, some kilometers south of Verona. The excavation campaigns yielded a total of 529 graves (62 cremations and 467 inhumations)

characterized by the presence of bronze objects, mostly weapons for males and pins for women.

The excellent state of preservation of skeletal remains and their anatomical completeness allowed a bioarchaeological research, which aims to reconstruct the history and the state of health of this community.

This paper concerns 12 cases of spondylolysis, a stress fracture in the pars interarticularis of the vertebrae, identified during the study.

This pathological modification is usually caused by a combination of repetitive flexion, extension, or rotation of the lumbar spine. This mechanism leads to stretching of the pars and eventually to a stress microfracture. With continued biomechanical stress due to repetitive movements an overt but incomplete fracture occurs that may progress to complete fracture. This injury involves predominantly L5, which is the vertebra subjected to the greatest amount of static and dynamic stress associated with daily activities.

So far, in the skeletal sample from Olmo di Nogara, spondylolyses have been found only on female skeletons, with the exception of 1 male case, where the fracture could be caused by a single traumatic event maybe due to habitual riding practices. The large prevalence of this injury among the female population could be due to a rather rigid division of labour, where women were most probably involved in every day hard physical and strenuous occupational activities.

Quintelier K.^{1,2}, Fuller B.T.^{3,4}, Müldner G.⁵, Van Neer W.⁶, Richards M.P.⁴ and Ervynck A.⁷

¹Flanders Heritage Agency, Koning Albert II laan 19 bus 5, B-1210 Brussels, Belgium.

²Ghent University, Department of Archaeology, Sint-Pietersnieuwstraat 35, B-9000 Ghent, Belgium.

³Laboratory of Animal Biodiversity and Systematics, Centre for Archaeological Sciences, Katholieke Universiteit Leuven, Ch. Debériotstraat 32, B-3000 Leuven, Belgium .

⁴Department of Human Evolution, Max Planck Institute for Evolutionary Anthropology, Deutscher Platz 6, 04103 Leipzig, Germany.

⁵Department of Archaeology, University of Reading, Whiteknights PO Box 227, Reading RG6 6AB, UK.

⁶Royal Belgian Institute of Natural Sciences, Vautierstraat 29, B-1000 Brussels, Belgium.

⁷Flanders Heritage Agency, Koning Albert II-laan 19 box 5, B-1210 Brussels, Belgium.

Poster

Dietary patterns in the mixed lay and monastic population from the post-medieval Carmelite friary burial grounds at Aalst (Flanders,

Belgium), and their relationship with DISH

Keywords: *stable isotopes, diet, gender, status, DISH.*

The focus of this study was twofold. The first goal was to reconstruct the dietary resources accessed and consumed by a post-medieval mixed lay and monastic population, evaluating possible intra-population diversity by comparing carbon and nitrogen (^{13}C and ^{15}N) stable isotope ratio results from different social, sex and age groups.

The data from the human remains show a linear pattern that stretches between terrestrial animal and marine fish data, indicating that measurable amounts of marine foods were consumed. A highly significant correlation is seen between the mean values for the sexes, whereby females show a relatively lower proportion of marine foods in their diet. Burial location indicates that marine food consumption was linked to wealth and status during the 16-18th centuries in Belgium.

The second goal of this research was to analyze the $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ stable isotope ratios of skeletons that displayed diffuse idiopathic skeletal hyperostosis (DISH), a condition of the vertebral column and other areas of the skeleton, of uncertain aetiology. The most prevalent theory suggests that it is caused by a diet rich in animal protein. Stable isotope analysis was used to test whether such a high trophic level diet could indeed be linked to the prevalence of DISH. Although there was no statistical difference between the males with and without DISH, the males with DISH had significantly higher $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ compared to the females.

Rivollat M., Castex D. and Tillier A.-M.

UMR 5199- PACEA, Anthropologie des Populations Passées et Présentes, Université Bordeaux 1, avenue des Facultés 33405 Talence, France.

Poster

A child with Down's Syndrome from Saint-Jean-des Vignes France dating to Early Middle Ages

This presentation describes a pathological immature skull recovered from the archaeological site of Saint-Jean-des Vignes (Saône et Loire, north-eastern France), dated to the 5th-6th centuries A.D. The age at death of the child was estimated by a variety of methods and supported an age closer to five to seven years. Dental and skeletal abnormalities were analyzed, and comparative analyses were conducted with other skeletal samples to explain the bone changes observed in this child. Other comparisons were made using data from people with Down's Syndrome diagnosed clinically.

The skull features (e.g. brachycephaly, metopism and other sutural abnormalities, a flattened occiput, hypertelorism, etc.) and dental alterations strongly suggested that the child had suffered from Down's syndrome. Unfortunately, other parts of the child's skeleton were not available for examination.

Robbins Schug G¹. and Gray K².

¹ Appalachian State University.

² University College London.

Poster

Leprosy and the Indus Civilization

This paper discusses evidence for leprosy at Indus Civilization sites in light of hypotheses about the role of urbanization and long-distance exchange in prehistoric migrations of *M. leprae*. Leprosy has long been associated with outcaste people suffering on the edge of civilization. Prior to recent eradication efforts, the disease was considered interwoven with civilization itself. Currently one-quarter of a million people still suffer from the disease. Despite its long history of interaction with humans and our strong concern with understanding the natural history of this disease, technical difficulties with culturing *M. leprae* have severely limited our understanding of the origins, evolution, and transmission of this disease. Recent archaeological research demonstrated leprosy affected the human population living at an Indus outpost in Rajasthan, India by 2000 B.C. This paper will discuss new skeletal evidence from Harappa, one of the largest cities in the Indus Civilization. Results of a recent analysis provide new evidence on the role of urbanization and exchange in the evolution of this pathogen in human populations.

Rossi C., Marini I., Fraternali L. and Canci A.

Dipartimento dei Beni Culturali: Archeologia, Storia dell'Arte, del Cinema e della Musica - Università degli Studi di Padova, Italy.

Poster

Face-down burials in the Roman world: physical, social and ideological reasons of a deviant practice. Archaeological and anthropological analysis of some examples from X regio (North-eastern Italy)

Keywords: *procubitus, deviant burial, immobilisation, Roman age, Padua.*

In Roman cemeteries the prone position is not common and can be considered a deviant way of burial. Sometimes it can be caused by lack of care in the interment, though frequently the perfect skeletal

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disposition and the placing of goods into the graves suggest a deliberate action. Romans gave a great importance to the funeral as the only way to enable the dead person to enter the Otherworld and to allow their relatives to come back purified into the living community. In order to achieve such an effect all rituals had to be carried out according to the rules. Therefore prone burials could be justified only as result of a deliberate choice.

Executed criminals or simply marginal people stigmatised for their lower social background, immoral jobs, or mental and/or physical defects or infectious diseases were often buried in this way, especially in peripheral zones of cemeteries. Their corpses could also be subjected to mutilation, nailing and other kinds of violence in order to punish them and ensure their eternal immobilisation in their tombs.

In case of accidents and mysterious deaths, considered to be the result of evil spirits in action, even respected and beloved people, such as children, young boys or girls who died before marriage, and women who passed on in pregnancy or giving birth might receive this same burial treatment. Their graves were not necessarily placed in marginal zones but included inside the cemeteries, in order to mark the esteem due to them and display relationships between members of the same community.

Both types of dead are represented among the cases here analysed, coming from urban (Patavium-Padua) and rural (Massaua di Villabartolomea-Verona) necropoli: the research combines archaeological analysis of tombs and grave-contents with anthropological study of the skeletal remains. The reconstruction of life style, age at death, pathological aspects and possible reasons of death confirm what the sources suggest and allow us to compare these new cases with the others already known from different parts of the Roman Empire.

Rühli F.

Centre for Evolutionary Medicine, University of Zurich, Switzerland.

Plenary lecture

Evidence-based paleopathology: How bones and mummies can really teach the living

Keywords: *Paleopathology, Medicine, Technology, Meta-analysis, Evidence.*

Paleopathology is a scientific field of long tradition. It has changed since the very early days to a modern discipline full of exciting research aims, state-of-the-art technology and unique samples. Nevertheless, often paleopathology is – compared to other fields of current

research – regarded as a “luxury” discipline, being rather *l’art pour l’art* than truly serving e.g. modern medicine and science. Some of these impressions are based on challenges inherited and mostly unchangeable for the field, such as the fact that e.g. sample sizes are small, personal clinical information lacking etc. However, by applying meta-analytic and more epidemiological approaches one may potentially increase the “level of evidence” for such research. The aim of this presentation is to review briefly the development of paleopathology as a research field, to address some of the critiques and also to highlight some of the solutions how to overcome this. Eventually, evidence-based paleopathology shall be a major research field contributing e.g. to the understanding of the evolution of human disease.

Rühli F.¹, Abar A.², Ali A.³, Brothwell D.⁴, Pollard M.⁵ and Stöllner T.²

¹Centre for Evolutionary Medicine, University of Zurich, Switzerland.

²German Mining Museum Bochum / Institute of Archeological Studies, Ruhr University Bochum, Germany.

³Miras farhangi, Zanjan, Iran.

⁴Department of Archeology, University of York, UK.

⁵Research Laboratory for Archeology and the History of Art, University of Oxford, UK.

Podium

The Chehr Abad Salt Men (1,500-2,500 BP) – a multidisciplinary mummy research project

Keywords: *mummies, Iran, paleopathology, taphonomy, salt.*

Almost 20 years ago, a first mummified ancient salt miner was incidentally unearthed at a salt mine near Zanjan, Iran. Since 2004/05, systematically conducted excavations led to the salvage of several spectacularly well-preserved salt mummies, some clothing and underground everyday commodities. Target-oriented work led to a detailed understanding of stratigraphical relations between layers, finds and formerly excavated mummies. As assumed before the miners had been killed during at least two mine disasters, which happened between ca. 2500 and 1500 years ago. The date is supported by a number of 14C-dates taken from freshly excavated layers. Samples of bones and soft tissues from all antique victims were sent to several European laboratories for further analyses. Work is currently continuing bringing together specialists from Iran, the European Union and Switzerland in a comprehensive campaign. Exemplary, one of the best preserved mummies has been recently rescanned in Tehran, as well as further ancient DNA analysis has been undertaken to reveal further paleopathological

information.

Saers J.P.P., Waters-Rist A.L., Hoogland M.L.P. and van Rijn R.R.

Poster

Limb Bone Morphology in an Archaeological Case of Achondroplastic Dwarfism

Keywords: *achondroplasia, limb bones, CT scans, osteoporosis, Netherlands.*

The recent excavation of a nineteenth century skeleton with achondroplastic dwarfism from the Dutch village of Middenbeemster presents a rare opportunity to determine the effects of this skeletal dysplasia on limb bone morphology. Archival data show the remains to be from a 66-year old female. Relative to normal adult females from the Middenbeemster cemetery proximal limb segments (the humerus and femur) are shortened by 20 to 28 percent respectively and distal limb segments (radius, ulna, tibia, fibula) are shortened by 16 to 19 percent. Many muscle attachment sites are pronounced, with the humeri having especially robust insertion points for the deltoid, teres major, and pectoralis major/latissimus dorsi combined. The femora are bowed in a medio-lateral plane causing a genu vara deformity which would have affected gait. Spinal stenosis is evident in the reduced size of neural canals of the fourth and fifth lumbar and fifth to eighth thoracic vertebrae. CT scans of limb bones show the effects of abnormal body shape and reveal osteoporosis as evidenced by percent cortical areas of all limb bones being two to three standard deviations below the adult female mean from Middenbeemster. Osteoporosis is common in modern post-menopausal women and in clinically documented achondroplastic individuals. Inactivity resulting from the neural complications of spinal stenosis may have been a contributing factor. The lower limbs display a very high amount of medio-lateral strengthening related to the bowing. Second moments of area of the humeri indicate much stronger proximal upper limb bones compared to the healthy adult female average. In all, these observations conform to predictions of mechanical modelling of the lower and upper limbs in an individual with disproportionate dwarfism. This study demonstrates the value of macroscopic analysis combined with medical imaging analysis of pathological specimens from archaeological contexts.

Salesse K.¹, Dufour É.², Wurster C.³, Brůžek J.¹, Giuliani R.⁴ and Castex D.¹

¹CNRS, UMR 5199 PACEA, Anthropologie des Populations

Passées et Présentes, Université Bordeaux 1, Avenue des Facultés, 33405 Talence cedex, France.

²Muséum National d'Histoire Naturelle, UMR 7209 Archéozoologie, Archéobotanique : sociétés, pratiques et environnements, 55 rue Buffon, CP 55, 75005 Paris, France.

³School of Earth and Environmental Sciences, James Cook University, Cairns QLD 4878, Australia.

⁴Pontificia Commissione di Archeologia Sacra, Rome, Italy.

Podium

Study of a mortality crisis in the catacomb of Saints Peter and Marcellinus, Rome (1st-3rd century AD): Assessment of biological affinities of the population through morphological dental traits and stable isotope analysis ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$, $\delta^{18}\text{O}$)

The catacomb of Saints Peter and Marcellinus located in the south-east of Rome approximately contains 25 000 graves dated from the 3rd to the 5th century AD. Seven newly discovered rooms having an unusual organization in the heart of the catacomb were investigated in 2003. Excavations of these rooms revealed a mass grave, where 3 000 corpses were laid together. These individuals were stacked in rows apparently following a common fatal incident. Presumably, this epidemic crisis occurred between the 1st and the 3rd century AD. The specific funerary treatment (textile wrapping and plaster) recalls mummification and might be related to exogenous practices, possibly connected to early Christians. Moreover, the presence of rare and expensive materials (e.g., Baltic amber, resins and gold threads) may indicate a high social status. Stable isotope analyses (carbon, nitrogen and oxygen) of bone collagen, bone apatite and tooth hydroxyapatite were carried out on 109 individuals to obtain further information on their diet and residential mobility. Additionally, a study of dental nonmetric traits was conducted on 3694 permanent teeth of about 300 individuals to define their biological distance and to assess their phenetic similarity. Dental morphology and isotopic data suggest that the individuals share close phenetic relations and constitute a biologically homogeneous population. Moreover, a high proportion of migrants and a high level of mobility are suggested. Finally, the comparison of isotopic data of the Saints Peter and Marcellinus individuals with those of individuals from different Italian roman sites highlights a higher rate of non local individuals, at least for the central part of the catacomb.

Salo K.¹, Mäkitie O.², Viljakainen H.² and Toiviainen-Salo S.³

¹Postgraduate student in Archaeology at the University of

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Helsinki, Finland.

²Children's Hospital, Helsinki University Central Hospital, University of Helsinki, Finland.

³Department of Radiology, University of Helsinki and HUS Radiology (Medical Imaging Center), Helsinki, Finland.

Podium

The use of Peripheral quantitative computed tomography (pQCT) in archaeology: the study of skeletal characteristics in 16th to 19th century children in Finland

Keywords: *pQCT, osteoporosis, paleoimaging, bone density, subadult.*

pQCT has been previously used in medical research to assess size and mineral density of long bones. The method allows detailed assessment of bone geometric and mineral properties separately for the cortical and trabecular bone. In this study we investigated if pQCT could be applied to archaeological bones. When evaluating archaeological bones, taphonomy and osteological paradox have to be considered.

We used pQCT to study midshaft and distal radius and tibia. Bones were measured for circumference, bone area and volumetric mineral density. Measurement was possible in 90 children and adolescents from four different archaeological sites in Finland dating from the 16th to 19th centuries. One fifth of the subadult individuals had no radius or tibia preserved well enough to allow reliable measurement.

Cortical bone mineral density increased with age in radius and tibia. This increase of density is in accordance with previous studies in living Finnish children. Trabecular bone density was more affected by taphonomy or the causes that have led to death of these children. Some differences in the density of the bones were obtained from the four archaeological sites.

Sandholzer M.¹, Tan Sui², Korsunsky A.M.², Teschler-Nicola M.³ and Landini G.¹

¹School of Dentistry, College of Medical and Dental Science, University of Birmingham, UK.

²Department of Engineering Science, University of Oxford, UK.

³Department of Anthropology, Natural History Museum Vienna, Austria.

Podium

Ultra-structural evaluation of cremated teeth using small and wide-angle x-ray scattering (SAXS/WAXS)

Keywords: *teeth, cremation, burned human remains, micro-CT, x-ray diffraction.*

Over the past years, close interdisciplinary co-operation has substantially increased our knowledge about cremation practices in prehistory. Macroscopic analysis of cremated human remains recovered from the bi-ritual middle Bronze Age cemetery of Pitten (Lower Austria, Austria) suggested a cremation temperature between 700 and 900°C based on the previous analyses of size and discolouration of the bone and teeth fragments. In this study, a combination of SAXS/WAXS and micro-CT was used to investigate and visualise heat-induced micro- and ultrastructural alterations of the cremated teeth.

High-resolution micro-CT scans (Voxel-size ~5µm, SkyScan 1172) were performed on 12 cremated teeth from three individuals of the Pitten cemetery and compared with experimental results from 12 tooth sections heated with an electric furnace at 400-900°C (30min exposure, in 100°C increments). The SAXS/WAXS experiments were performed on the I22 and B16 beamlines at the Diamond Light Source synchrotron facility (Oxford, UK) using monochromatic x-rays at a photon energy of 18 and 25keV. In total, 15 scattering patterns were collected repeatedly in transmission mode from fixed locations within each sample.

Three-dimensional models reconstructed from high-resolution micro-CT scans, showed a temperature-dependent increase of heat-induced cracks. The SAXS data implied that the hydroxyapatite crystal alignment varied as a function of position within the tooth; with most mineral particles being randomly orientated in dentine, but a stronger preferred orientation emerging in the enamel. All samples showed a similar trend of increasing mean crystal thickness from 400°C to 900°C.

In general, the experimental results of this study are consistent with the previous macroscopic results, suggesting a temperature exposure of a minimum of 700°C, more likely 900°C at the Pitten cremation site. Moreover, SAXS/WAXS and micro-CT proved to have advantages in the analysis of archaeological excavation material over earlier, mostly invasive or destructive, methods.

Schamall D.^{1,2}, Pietschmann P.¹, Moser D.³, Dockner M.⁴ and Teschler-Nicola M.^{2,4}

¹Department of Pathophysiology and Allergy Research, Centre for Pathophysiology, Infectiology and Immunology, Medical University of Vienna, Vienna, Austria.

²Department of Anthropology, Natural History Museum Vienna, Vienna, Austria.

³Department of Cranio-, Maxillofacial and Oral Surgery, Medical University of Vienna, Vienna, Austria.

⁴Department of Anthropology, University of Vienna, Vienna,

Austria.

Poster**Analysis of a mediaeval skeleton with contact injuries through μ CT and histology**

Keywords: *Monteggia fracture, multiple traumata, μ CT, histology, bone remodelling.*

Archaeological excavations in Altenberg / Linz (Upper Austria) provided the well-preserved skeletal remains of a mature male dated to the 13th century. Several elements of the skeleton yielded alterations caused by trauma: the left ulna showed a malunion accompanied by shortening of the diaphysis, the left radius exhibited a luxation and deformation of the head (Monteggia-type lesion, Bado-type I). Furthermore, at the anterior aspect of the corresponding humerus a chalice-shaped, newly built bone structure occurred that framed the displaced capitulum radii. This structure formed a sort of “alternative joint” that functionally even allowed some movements, although considerably restricted in regard to flexion / extension and to pronation / supination.

We investigated the concerned skeletal portions by gross-anatomical examination and by non-invasive conventional radiological and μ -CT-techniques. Moreover, we also carried out an invasive histological examination: small samples of the proliferative new “joint-bone” and callus formation were taken and embedded in methylmethacrylate; then undecalcified thin-ground sections were prepared, subjected to Thionin-staining and studied for their micro-structural architecture by light-microscopy.

Up to now, many clinical case studies dealt with Monteggia fractures and its consequences, e.g., the restriction of articulation due to bone proliferation at the radial head; nevertheless, a similar massive new bone formation as we observed at the humerus of this historical specimen has not yet been reported. Such a bone formation implies long-term survival and—because of the severe handicap—social care by members of the community. Taking the (similar) degree of remodelling at the injured skeletal elements into account, we assume and discuss the lesions as being caused by a complex, single event/accident.

Schats R.¹, Waters-Rist A.¹, Hermsen R.², Stamouli A.², Davies G.³ and Hoogland M.¹

¹Laboratory for Human Osteoarchaeology, Faculty of Archaeology, Leiden University.

²Nederlands Forensisch Instituut.

³Department of Petrology, Faculty of Earth and Life Science, VU University.

Podium**A Forensic Approach to Medieval Gunshot Trauma**

Keywords: *Mass graves, gunshot trauma, conflict reconstruction, isotopic and elemental analysis, medieval warfare.*

The cemetery of the Franciscan monastery in the Dutch city of Alkmaar, dating from 1448 to 1572, was excavated by Leiden University in 2010. Unexpectedly, two mass graves, containing 22 and 9 individuals respectively, were uncovered in this Late Medieval graveyard. It was hypothesised that these were related to the siege of Alkmaar by Spanish forces in 1573 during the Dutch Revolt. Physical anthropological results show that the individuals in the larger mass grave were all male and of relatively young age. The smaller mass grave contained both males and females, and also a boy around the age of 12 years. The osteological analysis showed evidence of gunshot trauma in four individuals. In one instance, a bullet was still present inside the cranium. In addition, 24 bullets of different calibres were collected from the two graves. Specific ballistics questions, such as 1) the provenance of the lead used for the fabrication of the bullets; 2) calibre of bullets; 3) kinetic energy of the bullets, and; 4) distance between the shooter and victims were addressed in collaboration with the Netherlands Forensic Institute and the Faculty of Earth and Life Sciences of the VU University. Isotope analysis was performed resulting in an isotopic signature which is used to link the bullets to specific lead sources. Furthermore, XRF analysis was executed to deduce the lead composition the bullets. Possible gunshot residue on the crania was analysed with the SEM. In addition, gunshot reconstruction was carried out to provide information on the nature of the gunfire, specifically speed of the bullets and distance between the shooter and victim. This paper presents the results of this interdisciplinary collaboration and discusses the implications for the understanding of an important historical event in Dutch Medieval history.

Participation for the Cockburn student prize.

Schutkowski H.¹ and Speith N.²

¹School of Applied Sciences, Bournemouth University, UK.

²Archaeological Sciences, University of Bradford, UK.

Podium**Health, diet and gender –patterns of complex identity in early medieval Pleidelsheim**

Keywords: *early medieval, identity, gender, status, diet.*

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During the 5th to 7th century AD, the Alamannic population of Pleidelsheim reveals distinct patterns of social organization, self representation, and display encoded in the combined biocultural data of the archaeological record and the human remains. In a time characterized by socio-political transition and the formation of new societal entities, the certainty of marked identity in death is crucial considering the fluidity of an open rank society during life. The study of 214 individuals (skeletal analysis) and a subsample of 98 (isotope analysis) in balanced proportions of males and females resulted in the following observations:

The funerary evidence suggests that gender identity is generally accentuated in both adult males and females in those burials that contain grave goods, providing the expression of an organizing societal principle that is also associated with the life course. The skeletons of both genders display signs of an active lifestyle throughout as presented by patterns of skeletal health and enthesal changes, while at the same time susceptible to any observed pathological condition, irrespective of funerary context. However, those males and females buried with grave goods exhibit a number of conditions that clearly distinguish them from other burial groups (e.g. trauma, spondyloarthropathy and dental disease).

Carbon and nitrogen isotope ratios of human bone collagen and associated faunal samples (n=30) reveal a number of complementary and corroborating principles. Both genders display age-related trends towards higher levels of protein intake; males show a strong association of grave good and artefact quality with dietary choice, a pattern which is mirrored by females for whom burial type is a good predictor of protein consumption. The findings demonstrate the possibility to detect overall congruent patterns of social display of engendered identity through subtle differences in dietary behaviour, burial rite and skeletal indicators of activity and health.

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Seiler R.¹, Zink A.² and Rühli F.¹

¹Centre for Evolutionary Medicine, University of Zürich, Switzerland.

²EURAC- Institute for Mummies and the Iceman, Bolzano, Italy.

Podium

Periodontitis of the Neolithic Iceman (3300 B.C): clinical aspects and aetiological considerations

Keywords: *Iceman, mummy, oral diseases,*

periodontitis.

The oral cavity of the Neolithic Iceman can be investigated by different ways: by direct macroscopic and endoscopic inspection or by radiological techniques. The first two give only limited access. But they give also precious information about oral diseases that other techniques can not furnish, as can be demonstrated in the case of the Iceman. He suffered from different oral pathologies, as caries, dental trauma and periodontitis. We focus here on his periodontal destruction. Again, inspection and pictures of the endoscopy give a first impression about the periodontal status of the anterior region. Conventional X-rays are mostly of no use because of the overlapping of the dento-alveolar structures. Only the CT-scans with their different possibilities of post-processing – 3D-reconstruction, calculated 3D-endoscopy and multiplanar reconstruction – permit an accurate description of the periodontal structures of the Iceman. Especially in the molar region periodontitis caused severe bone loss. As his caries lesions can be explained by his diet rich in carbohydrates, the aetiology of his periodontal disease is much more complex. Recent advances of the research in this field emphasize the genetically driven host response to the bacterial challenge. The actual aetiological model of periodontitis is discussed on the background of the sequencing of the Iceman's genome. Interesting is also the suspected relation of periodontitis with the generalized atherosclerotic disease the Iceman was also suffering from. Future research may help to render more precisely the Iceman's susceptibility to periodontal disease.

Shvedchikova T.

Institute of Archaeology, Russian Academy of Sciences, Moscow.

Poster

Killed or killers? The case study of the anthropological material from the Byzantine church crypt (Black Sea, Russia)

Keywords: *Sable wounds, Byzantia, bioarchaeological reconstruction.*

In 2010-2011 the salvage excavations of Middle Byzantine church (9-11 CE) in the region of village Veseloe, (Imeretinskaya lowland, Black Sea) in the region of constructing the Olympic objects were held. This unique and well preserved architectural model was build by Greek masters from the local sandstone and included the underground burial vault of 2x8 meters. Mass grave consisted of remains of more than 10 people, some animal bones, scattered inside the crypt. All anthropological material was studied according

bioarchaeological approach. Severe wounds on the temporal and parietal bones of young adults (all males) were found. According to the character of injuries it could be possible to reconstruct the weapon by which it was done and conjecture the occupation of people buried in the crypt.

Sella-Tunis T.^{1,4}, Peled N.², Vered M.³, Feldman M.¹, Abramov J.¹, Medlej B.¹, Vardimon A.D.⁴ and Hershkovitz I.¹

¹Department of Anatomy and Anthropology, Sackler Faculty of Medicine, Tel Aviv University, Israel.

²Department of Radiology, Carmel Medical Center, Haifa, Israel.

³Department of Oral Pathology and Oral Medicine, The Maurice and Gabriela Goldschleger School of Dental Medicine, Tel Aviv University, Tel Aviv, Israel.

⁴Department of Orthodontics, The Maurice and Gabriela Goldschleger School of Dental Medicine Tel Aviv University, Tel Aviv, Israel.

Poster

Unusual Pathology in a Human Male Mandible dating from the PPNB Period, Yiftahel, Israel

Keywords: *Osteolytic lesion; Mandible pathology; Computed Tomography; Bioarchaeology; PPNB period.*

Introduction: A case of an unusual solitary osteolytic lesion was found in the mandible of an approximately 45-55-year-old male from the Pre-Pottery Neolithic B period (7500-6000 B.C.E.) at the site of Yiftahel (Lower Galilee, Israel).

Methods: All skeletal remains were searched for pathological lesions. The mandible was carefully examined by a magnifying glass; CT scanned (Philips iCT 256 scanner) and reviewed using a Brilliance Workspace Portal (Philips Medical Systems, Cleveland, Ohio).

Results: The mandible was incomplete and included the right ramus, the chin area and the left body (canine to third molar). A bony defect consisting of loss of the buccal cortical bone was present from the mesial aspect of the first molar to the distal aspect of the third molar with exposure of the intact roots of these teeth. The buccal cortical bone below the level of the apices of the involved teeth, in the area of the external oblique ridge, manifested a «shelf»-like appearance, had smooth surface and overlaid a slightly expanded mandibular bone. The second and third molars had a lingual position within the dental arch. The lingual cortical plate was intact.

Conclusion: The well-defined outline of the

cortical bone defect and the intact adjacent dentition may raise the possibility of a slow growing, progressive local process originating in the adjacent soft tissues that exerted a mild but long-term impact on the bony structures. Among these processes, reactive or benign neoplasms originating in the gingiva or adjacent buccal mucosa are included. Alternatively, the bony defect could be associated with a habitual behavior.

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Slon V.¹, Cohen H.¹, Abramov J.¹, Sella-Tunis T.¹, Hershkovitz I.¹ and Peled N.²

¹Department of Anatomy and Anthropology, Sackler Faculty of Medicine, Tel-Aviv University, Ramat-Aviv, Israel.

²Department of Radiology, Carmel Medical Center, Haifa, Israel.

Podium

The “Cave of the Warrior” Revisited - Differential Diagnosis for the Unilateral Endocranial Thickening of a 6,000 years old Skull

Keywords: *cranial hyperostosis, Dyke-Davidoff-Masson syndrome, cerebral hemiatrophy, computed tomography, medical imaging.*

Introduction: The paleopathological investigation of an adult male discovered in Wadi el-Makkukh (Judean Desert), dating from the Chalcolithic period (4th millennium BCE), was recently “reopened” in order to diagnose an unusual pathology, which was revealed when the osteological remains underwent computed tomography (CT) examination.

Methods: CT scans were performed using a Philips iCT 256 scanner at the Carmel Medical Center in Haifa, Israel, and reviewed using a Brilliance Workspace Portal (Philips Medical Systems, Cleveland, Ohio).

Results: Scans of the cranium revealed localized thickening of the right frontal bone, causing expansion of the diploic space on the affected side. Due to the invagination of the inner table, the frontal cranial fossa on the right side was greatly reduced, compared to the left. Contrastingly, the posterior fossa is smaller on the left side. Other abnormalities in the skull included the enlargement of the maxillary sinuses; the elevation of the petrous part of the temporal bone and of the sphenoid bone on the right side; and the absence of convolutional markings above the right orbital roof.

Conclusions: The most probable diagnosis for these intriguing clinical features is Dyke-Davidoff-

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Masson syndrome (cerebral hemiatrophy), a rare disorder insofar unknown in the paleopathological record. Differential diagnosis includes intradiploic hematoma, lipoma of the skull, fibrous dysplasia, unilateral hyperostosis frontalis interna, meningioma, and progressive facial hemiatrophy (Parry-Romberg syndrome). As visual external assessment of the cranium revealed no gross deformations or evidence of trauma, the discovery of this unusual pathology emphasizes the value of employing medical imaging in paleopathology research.

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Spannagl-Steiner M.¹, Novotny F.¹, Krenn-Leeb A.³ and Teschler-Nicola M.^{1,2}

¹Department of Anthropology, National History Museum, Vienna, Austria.

²Department of Anthropology, University of Vienna, Austria.

³Department of Prehistory and Medieval Archaeology, University of Vienna, Austria.

Poster

Burdens of Early Bronze Age Childhood: Two examples of bone resorption and bone formation at Hainburg-Teichtal (Lower Austria)

Keywords: *osteolytic and inflammatory lesions, subadults, "Langerhans Cell Histiocytosis (LCH)", osteomyelitis, Early Bronze Age.*

The Early Bronze Age cemetery of Hainburg-Teichtal (belonging to the "Wieselburg Culture" in Eastern Austria) lays currently in the center of archaeologists and anthropologists interest: The research projects about Hainburg-Teichtal with the closed exhibition "Lebenswelten/Live worlds" addresses many cultural, social archaeological and biological issues, such as ritual and social practices, metallurgy, trading routes, resource management, mobility and migration of the Early Bronze Age in Central Europe, the reconstruction of dietary-patterns and the investigation of pathological skeletal changes.

The present study focuses on two examples of subadult individuals which show conspicuous bone resorption and bone formation. We used macroscopic inspection, a reflector microscope and radiography for the anthropological investigation and differential diagnosis.

In the case of the 9-year-old child (grave no.

204) circular osteolytic lesions were found in the right shoulder joint and in the flat bones of the hip. Moreover, new bone formations due to inflammatory and hemorrhagic processes were located on the lateral and medial aspect of the affected hip bones. These changes may be induced by a primary tumorous process, e.g., "Langerhans cell histiocytosis" (LCH) or by metastases or other granulomatous inflammatory diseases, e.g., tuberculosis. Furthermore, a circular defect (D=1cm) in the frontal bone was observed; this trauma (?) probably caused the death of the child.

The second case, a 12-year-old child (grave no. 223), reveals an advanced remodelled fracture in the distal part of the left radius accompanied by an infection. It is very likely that this complex fracture induced osteomyelitic skeletal changes (a circular cavity within the compact bone at the femur and a spindle-like swelling at both tibiae). But the differential diagnosis has to consider Ewing-sarcoma as well.

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Stein D., Slon V., Abbas J., Cohen H., Sella-Tunis T. and Hershkovitz I.

Department of Anatomy and Anthropology, Sackler Faculty of Medicine, Tel Aviv University, 69978, Israel.

Podium

What does the epiphyseal ring tell us about spinal diseases in general and intervertebral disc pathologies in particular in ancient populations?

Keywords: *Intervertebral disc, Spine pathologies, Epiphyseal ring, Evolutionary medicine.*

Since the intervertebral discs, major components of the spine, do not survive the maceration process, the only skeletal markers that may shed light on the disc are the size of the discal surface areas of the vertebrae and the relative sizes, shape and completeness of the epiphyseal (annular) rings (ER). The current study is looking at the characteristics of the ER as a potential diagnostic tool for identifying spinal diseases in past human populations.

The Intervertebral disc is constructed of a central nucleus pulposus and an outer fibrous structure, the annulus fibrosus. Given the high impact of intervertebral disc pathologies on modern life, it is probable that understanding the state of the intervertebral disc of skeletal remains could shed much needed light on the way of life in ancient times.

The ER, on which the annulus fibrosus fibers are anchored, is a bony, subchondral ring encircling the external margins of the vertebral discal surfaces. In pre-puberty, the osseous rim is separated from the vertebral body by a cartilaginous growth plate. However, at approximately age 14 to 15, initial synostosis of the bony annular rim and the vertebral body occurs. Complete fusion takes place between ages 18 to 25.

In this study we will present a battery of epiphyseal rings and their associated maladies.

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Participation for the Cockburn prize for students.

Steyn M.

Forensic Anthropology Research Centre (FARC), Department of Anatomy, University of Pretoria, South Africa.

Poster

Skeletal identity of past populations: unstudied European, American and African remains

Keywords: *skeletal collections, Khoesan, palaeopathology, museums.*

In the past human remains were often collected, exchanged and studied in an unethical manner. Remains of especially Khoesan people from southern Africa were collected and exported to Europe where they were kept as rarities in museums. Relatively little is known about these remains, and some are quite contentious. In addition, several skeletal collections from southern Africa have been studied extensively (e.g., K2 and Mapungubwe), whereas many others are long forgotten and have never been assessed. It is important that we know what remains are held where so that ethical considerations regarding research can be addressed and their future assessed. Analysis of unknown collections can also fill in some gaps regarding the broader southern African history. The aims of this SANPAD-funded project include analyzing the largely unstudied collections of African human remains that are housed in several museums in Europe, the US and southern Africa. This is done in collaboration with the University of Cape Town, the McGregor Museum (Kimberley), and University of Leiden (The Netherlands). To date, skeletons in Belgium, Vienna, Paris, the Netherlands and US as well as Zimbabwe and Botswana have been analyzed, numbering > 400 individuals. Information is used to assess past health, growth and life style, as well as patterns of sexual dimorphism. Preliminary results indicate high disease loads and stress in especially the Khoesan individuals, who were extremely marginalized by the late 19th century. This project is not aimed at repatriation, but it is important that we know where these remains are. They have considerable research potential, but this should be done in a respectful manner, and for the benefit of all southern Africans.

Steyn M. and Sutherland N.

Forensic Anthropology Research Centre (FARC), Department of Anatomy, University of Pretoria, South Africa.

Poster

Forensic anthropology case study: Possible foetal alcohol syndrome?

Keywords: *Palaeopathology, congenital, FAS, alcohol abuse.*

Pathological changes in skeletal remains are difficult to diagnose, but may provide some clues as to the personal history and identification of an individual. In 2011 a skeletonised forensic case of a juvenile individual was received from the Northern Cape (South

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Africa). The remains were suspected to have belonged to a girl who went missing in 2003. The aim of this study is to report on the skeletal findings from this case. Anthropological assessment indicated that the remains belonged to a possibly female individual of 12-15 years. Several pathological changes and skeletal abnormalities were observed which included an abnormally shaped head with bulging forehead, slight microcephaly, facial asymmetry, enamel hypoplasia, cribra orbitalia, spina bifida occulta of L1 and growth retardation. A tentative diagnosis of foetal alcohol syndrome (FAS) was made. After a personal identification using DNA, the SAPS confirmed that the parents of this child have a history of longstanding, excessive alcohol abuse. FAS occurs in children born to women who consume large quantities of alcohol during pregnancy. The differential diagnosis in this case includes malnutrition, chronic infectious disease or mental retardation from other causes. Although not conclusive, the combination of abnormalities seen in this individual is strongly suggestive of FAS, and to our knowledge this is the first skeletal case with this condition to be reported.

Sundman E.A. and Kjellström A.

Osteoarchaeological Research Laboratory, Department of Archaeology and Classical Studies, Stockholm University, 106 91, Stockholm, Sweden.

Poster

Signs of sinusitis associated with urbanisation in Viking Age-early medieval Sweden

Keywords: *sinusitis, maxillary sinus, Birka, Sigtuna, urbanization, Lake Mälaren.*

his study considers the effects of urbanisation on respiratory health during the Viking Age (AD 700-1050) and early medieval period (AD 1050-1200) in Sweden. It is based on a palaeopathological analysis of chronic maxillary sinusitis in skeletal populations from rural cemeteries in the valley of the Lake Mälaren, and the cemeteries of the nearby proto-urban port of trade Birka.

Using the diagnostic criteria of Boocock and colleagues (1995), the study showed that there was no significant difference in the overall prevalence of chronic maxillary sinusitis between the rural and proto-urban populations. In a comparison with the population from the initial phase of the Viking age/early medieval town of Sigtuna, investigated in a previous study, both the Mälaren valley and Birka populations, however, display significantly lower rates of chronic maxillary sinusitis.

These data would imply that urbanisation had a negative impact on respiratory health. Unlike the

Mälaren Valley and Sigtuna populations, a significant difference between the sexes was observed in the Birka population, where more females than males were affected. This may indicate a differentiation relating to gender, where males and females – through divisions in types of labour, occupation and environment – were exposed to different risk factors.

Swanepoel E.J. and Steyn M.

Forensic Anthropology Research Centre, Department of Anatomy, School of Medicine, Faculty of Health Sciences, University of Pretoria, Pretoria, South Africa.

Podium

Dambarare, Zimbabwe: A preliminary report on the skeletal remains of its 17th century inhabitants

Dambarare, one of the three most important Portuguese “feiras” (markets) in Africa during the seventeenth century, was a large settlement site in northern Zimbabwe, approximately 40km from Harare. Garlake (1967) excavated a small area of a church site which revealed burials beneath the floors and alongside the walls of the building. This site yielded skeletal remains, personal belongings and artifacts. Skeletal remains of Portuguese men were buried inside the church, while remains of African women and children as well as one African male were interred outside. The aim of this study was to analyze the Dambarare skeletal remains as part of a larger study on a comparison of the demography and health status of various African groups from northern Zimbabwe. A total of 40 individuals which comprised of infants, juveniles and adults with a representation of both African and European ancestry as well as both sexes were identified. Skeletal remains showed subperiosteal bone growth in 21.4% individuals in the European sample and 14.2 % in the Africans. An abundance of Schmorl’s nodes (27.3%) were observed in the European grouping, but none in the African sample. Periodontal disease was present in more than 90% individuals in both groupings, whereas caries affected 23.1% of the Europeans and 42.9% of the Africans. Antemortem tooth loss was extremely high in the European sample (69.2%) in comparison with the much lower incidence of 28.6% individuals in the African grouping. Enamel hypoplasia was also common at 53.8% of the Europeans and 28.6% of the Africans affected, often represented by multiple lines. Trephination was observed in a young African female; the healed lesion situated uncommonly on the sagittal suture. These preliminary results suggest poor health and malnutrition of specifically the European population occupying the Dambarare area during the seventeenth century, versus a relative healthier African

population.

Tafuri M.A.¹, Cupitò M.², Salzani L.³, Moggi Cecchi J.⁴, Varalli A.^{4,5} and Canci A.²

¹McDonald Institute for Archaeological Research, Downing Street, Cambridge CB2 3ER, UK.

²Dipartimento di Archeologia, Università degli Studi di Padova, Piazza Capitaniato 7 - 35139 Padova, Italy.

³Soprintendenza per i beni archeologici del Veneto, Piazza San Fermo, 3 - 37121 Verona, Italy.

⁴Dipartimento di Biologia Evoluzionistica, Università degli Studi di Firenze, Via Romana, 17 50125 Firenze, Italy.

⁵Laboratoire Méditerranéen de Préhistoire Europe Afrique, 5 rue du Château de l'Horloge 13094 Aix-en-Provence, France.

Podium

Dietary complexity in Bronze Age Italy: the isotopic evidence

Keywords: *Carbon, Nitrogen, Bronze Age, Italy, Diet.*

With most palaeoeconomic studies continuing to equate economy with a list of the foods humans ate, the complexity of dietary practices in prehistoric Italy has seldom been questioned. This is particularly true for later phases of the prehistory, when the onset of fully productive economies has diverted the attention on food as a proxy of cultural change. One reason for this has been limited methodologies for investigating not only what foods were produced but also what foods people consumed. Stable Carbon and Nitrogen isotope analysis of human collagen preserved in ancient skeletal remains represents a direct scientific method to investigate on the diet of past populations, and is increasingly applied in archaeological investigations.

We have undertaken an isotope investigation on human and animal collagen from several Bronze Age sites of the Peninsula. Our results have revealed substantial distinctions between northern and southern regions, with the presence of specialized crops at very early phases. Intrasite differences are also indicative of social complexity and might relate to conflict and warfare.

Teschler-Nicola M.^{1,2}, Novotny F.¹, Spannagl-Steiner M.¹, Irrgeher J.³, Prohaska T.³, Rumpelmayr K.⁴, Wild E.-M.⁴, Däubel B.⁵ and Haring E.⁵

¹Department of Anthropology, Natural History Museum Vienna.

²Department of Anthropology, University of Vienna.

³Department of Chemistry, University of Natural Res. and Appl. Life. Sci. Vienna.

⁴Faculty of Physics - Isotope Research, University of Vienna.

⁵Central Research Laboratories, Natural History Museum Vienna.

Podium

The Early Mediaeval Manor at Gars/Thunau (Lower Austria): a Region of Endemic Tuberculosis?

Over the last decades, an increasing number of studies aimed to shed light on the origin and spread of tuberculosis in past human populations. To a great deal these studies were based on macro- and microscopic investigations of pathological lesions and included a variety of features, such as the “classical” Pott’s disease and joint tuberculosis. More recently, also other pathological (unspecific) features probably linked with *M. tuberculosis* infection such as rib lesions and endocranial alterations (comprising different features in form of small “pits”, and “new bone formation”) were recorded and discussed in regard to their differential diagnostic potential.

Here we present the results of a systematic palaeopathological survey of the Early Mediaeval population of Gars/Thunau (Lower Austria), which – at this stage – includes a number of 373 individuals, recovered at two archaeological sub-sites, a necropolis within a (densely populated) fortified settlement (including a manor house) at the top of a hill and a riverine settlement with numerous burials in the valley area. At the latter, an area which was probably less densely populated, archaeological evidence for large-scale handicraft and agricultural activities were documented. Thus, we hypothesise that the two contemporary populations of Gars/Thunau differ not only in their social affiliation/condition, but also in their type and frequencies of population density related infectious diseases (in particular tuberculosis). Moreover, we investigated the molecular evidence of the causative organism in three immature individuals exhibiting pathological changes at the internal cranial layer and discuss these findings in regard to the macroscopic features observed.

Tesorieri M.

University College Cork, Cork, Ireland.

Poster

Palaeopathology from the enclosed cemetery at Ballinderry, Co. Kildare

Keywords: *late medieval Ireland, early modern Ireland, infectious disease, asymmetry, tuberculosis.*

Excavations in 2004 and 2007 in Ballinderry, Co. Kildare revealed an enclosed cemetery located at the top of a hill, with radiocarbon dating placing the use of the cemetery within the late medieval/early modern period. The late dating of the site emphasizes its importance,

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as it is one of the few known rural collections from County Kildare dating to this period. A total of 240 individuals were recovered from the site, representing both sexes and all age categories. An unusually large array of pathological conditions was observed within the assemblage including extensive dental disease and traumatic lesions.

Most interesting were cases that included a young adult male with resorption of the mental trigon. The missing alveolus extends from tooth 35 to 43, with slight porosity and woven bone formation apparent on both the anterior and posterior surface of the mandible. A second individual, a mature adult male, had extensive asymmetry of the upper and lower extremities. The asymmetry extended to the shoulder girdle, hands and feet, with accessory facets located on superior surface of the right metatarsals, suggesting toe-walking. The features found on the skeleton are most likely associated with poliomyelitis or cerebral palsy. A third individual, an adolescent between the ages of 14 to 19 was found to have a severe infection of the right mastoid process, extending into the mandible with a perforating lesion on the ascending ramus. Bone destruction was also visible around the left acetabulum and thickening of the right tibia. Tuberculosis otitis is suggested as the most likely cause for the lesions found on this skeleton.

Tillier A.-M.¹, Coqueugniot H.¹, Arensburg B.² and Dutour O.^{3,1,4}

¹UMR 5199- PACEA, Anthropologie des Populations Passées et Présentes, Université Bordeaux 1, avenue des Facultés 33405 Talence, France.

²Department of Anatomy and Anthropology, Sackler School of Medicine, Tel Aviv University, Ramat Aviv 69978, Israel.

³Laboratoire de Paléanthropologie, Ecole Pratiques des Hautes Etudes (EPHE).

⁴Department of Anthropology, University of Toronto, Canada.

Podium

Qafzeh 11 adolescent skull from layer XXIII (dated to 92 ± 5 ka BP): paleopathological reappraisal using 3D reconstructions

Keywords: *Middle Palaeolithic, Levant, child skull, 3D imaging techniques, trauma.*

The Israeli Qafzeh Cave yielded one of the largest Middle Palaeolithic hominid sample known from a single site in the Levant. This sample consists of partial skeletons dated to 92 ± 5 ka BP which represented Mousterian hunter-gatherers commonly accepted as early anatomically modern humans (Vandermeersch 1981; Tillier 1999). A majority of the Qafzeh individuals failed to attain reproductive adulthood and

some of them have survived the insult sufficiently to leave diagnosable lesions. Among them, Qafzeh 11, circa 13 yrs old at death, presents a right frontal bone lesion that has been previously attributed to healed trauma (Dastugue 1981; Tillier et al. 2004), a unique case within the human sample. The circumstances surrounding the wounding remained unknown and the healing response had not undergone its complete trajectory before the death of the individual who was intentionally buried with an animal offering.

Other changes affecting the global cranial morphology of this specimen (e.g. vault asymmetry and base angulation) have been already mentioned (Tillier 1984) but their causes still remain unclear. The goal of this study is to reappraise these changes, using 3D imaging techniques, in order to better understand their real nature (pathology versus taphonomy). Comparisons with non pathological immature skulls coming from a digital bone library (Coqueugniot and Hublin 2012) allowed to set this fossil specimen within normal modern variability. Moreover, thanks to the advances provided by digital reconstructions, it is now possible to reassess the traumatic conditions as well as other morphological changes, by visualizing surfaces (internal and external) and inner structures.

Acknowledgments: This study was made possible through the courtesy of Professor N. Peled (Haifa Carmel Hospital). Thanks are also due to Professor I. Hershkovitz and V. Slon (Tel Aviv University), B. Dutailly (UMR 5199 PACEA) for their help in collecting digital data. This research has been supported by the Irene Levi Sala Care Archaeological Foundation.

Tur S.S.

Altai State University, Russia.

Poster

Osteoarthritis at the temporomandibular joint in préhistoric pastoral populations from Altai, Russia: Prevalence and etiology

Keywords: *osteoarthritis, temporomandibular joint, prehistoric pastoralism.*

Degenerative disorders (osteoarthritis) in the temporomandibular joint (TMJ) have complex etiology. The available data from the clinical and paleopathological literature provide conflicting information about relationships between the pathology and such factors as age, sex, occlusal loss, and dental wear.

The aim of the study is to assess the frequency and distribution of TMJ osteoarthritis in the Bronze to Early Iron Age pastoral populations (3,000-1,000 BC)

of Altai, Russia, and to explore the factors potentially contributing to the development of this condition.

The temporal and condylar surfaces of the TMJ were examined in 710 adult skulls. The skeletal remains were sorted by chronological period, cultural attribution, ecological zone, local group, sex, and age. Two age categories (under and over 35 years) were analyzed. Degenerative alterations, both erosions and osteophytes, in the TMJ were graded as absent, mild, moderate, and severe. In addition, ante-mortem tooth loss, molar wear, and dental fractures were recorded. The data were assessed statistically using log-linear analysis of frequency tables and Mann-Whitney U test.

In the sample studied, 57% of individuals display TMJ osteoarthritis. Both the frequency and severity of the lesions increase significantly with age. The sex-, chronology-, culture-, and location-related differences are not statistically significant. Degenerative changes at the TMJ strongly correspond with ante-mortem tooth loss and molar wear in both age groups. Besides, the frequency of the dental fractures is higher among individuals with TMJ osteoarthritis than among individuals with the intact joint, but this trend reaches the level of statistical significance only in males.

The results of this study provide new evidence of the role of functional overloading in the development of degenerative changes at the TMJ.

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Van der Merwe A.E.^{1,3}, Weston D.A.^{2,4,6}, Oostra R.J.¹ and Maat G.J.R.^{3,5}

¹Dept. of Anatomy, Embryology and Physiology, Academic Medical Centre, 1100 DD, Amsterdam, the Netherlands.

²Dept. of Anthropology, University of British Columbia, V6T 1Z1, Vancouver, Canada.

³Dept. of Anatomy and Embryology, Leiden University Medical Centre, 2333 ZC, Leiden, the Netherlands.

⁴Dept of Human Evolution, Max Planck Institute for Evolutionary Anthropology, 04105 Leipzig, Germany.

⁵Dept. of Anatomy, University of Pretoria, Pretoria, 0001, South Africa.

⁶Faculty of Archaeology, Leiden University, 2300 BE, Leiden, the Netherlands.

Poster

A rare case of sternal clefting: a discussion and differential diagnosis

Keywords: *bifurcating sternum, sternal cleft, sternal development.*

A sternal cleft or bifid sternum is a rare anterior chest wall abnormality. Although it has been relatively well described in clinical literature, very little reference has been made to this anomaly in palaeopathological texts. This poster presents a case of superior sternal clefting observed in a middle-aged female with concurrent Paget's disease and congenital hyperkyphosis excavated from a 19th century Dutch psychiatric asylum cemetery in Bloemendaal, the Netherlands. In an attempt to understand the morphology of the anomaly the embryological development of the sternum is reviewed and a differential diagnosis is performed on the suite of observed skeletal anomalies. Although the skeletal anomalies observed may appear as single, non-syndromic entities, Goltz syndrome, congenital hypothyroidism, disruption of the Hoxb-4 gene, acute excessive maternal alcohol consumption during pregnancy, Coffin-Lowry syndrome and PHACES association were also considered as possible causative agents, with the latter two conditions determined to be the most likely. The psychiatric asylum context from which the individual came supported the differential diagnosis as both Coffin-Lowry syndrome and PHASES association result in neurological signs and mental retardation or developmental delay. This poster demonstrates that the integration of embryology, modern clinical literature and palaeopathological principles are all vital in the interpretation of developmental anomalies from an archaeological context.

Ventura L.¹, Arrizza L.², Biamonte A.S.³, Flati G.³, Giuffra V.⁴ and Fornaciari G.⁴

¹Department of Pathology, San Salvatore Hospital, L'Aquila, Italy.

²Centre of Microscopies; University of L'Aquila, Italy.

³Department of Dermatology, San Salvatore Hospital, L'Aquila, Italy.

⁴Division of Paleopathology and History of Medicine and Bioethics, Department of Oncology, Transplants and Advanced Technologies in Medicine, University of Pisa, Italy.

Poster

Evidence of nail care in a modern mummy from Cermoneta (Central Italy)

Keywords: *Fingernails, Nail Care, Manicure, Nail Polish, Anthropology.*

Since the first exploration, a pair of hands with clear, white nails was visible in a crypt of the church of San Michele Arcangelo in Sermoneta. They belonged to a partially mummified female of 32-40 years of age at death and displayed all but one (right fifth) of the fingernails. At direct and digital dermoscopic examination, these latter appeared well preserved and diffusely coloured in white, with generally intact

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cuticles.

The left fourth fingernail was carefully extracted from its bed and submitted to stereomicroscopy, scanning electron microscopy (SEM), also with energy dispersive X-ray (EDX) analysis, in order to evaluate its features and establish the chemical composition of white substance, following a conservative approach.

Stereomicroscopy allowed to appreciate differences between dorsal (pigmented) and ventral (unstained) surfaces, as well as to closely inspect the nail root and the free edge contours. SEM evidenced further details of such structures, enabling us to select areas for EDX measurements. The following elements were detected:

C, O, S, Mg, Cl, K, P and Ca in unstained areas of dorsal surface and in ventral one, indicating the organic structures of the nail;

O, S and Ca in the pigmented areas, suggesting the presence of CaSO₄ used as a nail polish;

Al, Fe and Si in the free edge, referred to remnants from manicure devices.

The presence of calcium sulfate (chalk, plaster) allowed the preservation of the fingernails, that often disappear following death.

According to the history of nail care, the chemical composition of the polish and the nail shape helped to date back the death of the subject to the very first decades of XX century. At that time women used to stain their nails with tinted powders, buffing them shiny and naturally coloured, even though in this case the procedure could be performed before or after death.

Ventura L.¹, Arrizza L.², Capulli M.³, Quaresima R.⁴, Giuffra V.⁵, Teti A.³ and Fornaciari G.⁵

¹Department of Pathology, San Salvatore Hospital, L'Aquila, Italy.

²Centre of Microscopies; University of L'Aquila, Italy.

³Department of Applied Clinical Sciences and Biotechnologies, University of L'Aquila, Italy.

⁴Department of Chemistry and Chemical Engineering, University of L'Aquila, Italy.

⁵Division of Paleopathology and History of Medicine and Bioethics, Department of Oncology, Transplants and Advanced Technologies in Medicine, University of Pisa, Italy.

Podium

A multidisciplinary approach to the study of ancient renal stones

Keywords: urolithiasis, renal stones, micro CT, SEM-EDX, non-destructive methods.

The renal stones found in the mummies of Pandolfo III Malatesta, Lord of Fano (1370-1427) and

an anonymous nobleman from Popoli (XVIII century) were investigated using different techniques.

Both specimens were examined with binocular stereomicroscopy (BSM) and scanning electron microscopy (SEM), also with energy dispersive X-ray analysis (EDX). Multiple tiny fragments from surface and inner portions were submitted to X-ray diffraction (XRD) analysis. Subsequently, the calculi were imaged with microcomputed tomography (micro CT).

The stone of Pandolfo had a mulberry-like surface with honey brown colour and measured 12 mm in largest diameter. Along with the organic constituents (C, O, N), the following chemical elements were detected: K, S, Si, Cl, Ca, P, Na and Ba. The calculus was composed of ammonium acid urate (95%) and calcium oxalate dihydrate (weddellite) (5%). Internal structure consisted of aggregated large spheroidal crystals with different density values.

In the case from Popoli, the ovoidal mass with small superficial spherical buds measured 22x16x15 mm. The cut surface showed a central nucleus of sharp-edged crystals and concentric laminations. Detected chemical elements were: C, O, N, Ca, P, K, S, Cl, Na. The stone composition was calcium oxalate monohydrate (whewellite) (90%) and calcium phosphate (hydroxylapatite) (10%). Internal structure detail revealed concentric laminations and aggregates of similar density values.

These observations enabled us to propose an ideal protocol for the examination of stones that can be found in mummies and in osteoarcheological material. After preliminary observation with BSM, the specimen should be imaged with microCT, in order to trace a detailed map of the external surface and the entire calculus, guiding the following SEM-EDX measurements for elemental distribution analysis. Matching the results from these methods avoids destructive XRD analysis and may allow to obtain an affordable evaluation of chemical composition on the entire stone, following a conservative approach.

Ventura L.¹, Miranda G.², Mercurio C.¹, Papola F.³, Giuffra V.⁴ and Fornaciari G.⁴

¹Department of Pathology, San Salvatore Hospital, L'Aquila, Italy.

²Department of Environmental Sciences; University of L'Aquila, Italy.

³Regional Centre of Immunohematology and Tissue Typing, San Salvatore Hospital, L'Aquila, Italy.

⁴Division of Paleopathology and History of Medicine and Bioethics, Department of Oncology, Transplants and Advanced Technologies in Medicine, University of Pisa, Italy.

Poster

The mummified bodies from the church of San Michele Arcangelo in Sermoneta (Central Italy)

Keywords: *Mummies, Paleopathology, Modern Age, Lazio, Central Italy.*

The church of San Michele Arcangelo in Sermoneta dates back to XII century and is located in the oldest part of the village. Recent restorations allowed to find five distinct burial ambients, close to the external walls of the village. Most of these crypts were ossuaries, but one of them contained 7 partially mummified individuals. Moreover, at the top of one ossuary an incomplete, well-preserved mummy, featuring head, neck, arms and trunk, was recovered.

From an anthropological viewpoint, the series from the same burial included 6 adults (1 male, 5 females), between 18 and 60 years of age, and 1 infant with an age at death of 3-4 years. The stature of the adult subjects ranged from 148 to 171 cm. The examination of fabric fragments allowed to date the individuals back to the end of XIX century. The incomplete mummy belonged to an undeterminate adult subject, wearing clothes dating back to XVIII-XIX century.

Occasional macroscopic evidence of organs was represented by pelvic viscera in one subject and the left breast in another one. Skin, skeletal muscles and superficial structures (eyes, ears, hair, nails) appeared well preserved throughout the whole series. This suggests the preminent role of desiccation in the mummification process.

The initial paleopathologic analysis identified poor dental status (caries in 5 individuals, periodontal disease in 2 and dental wear in 4) and 1 dental anomaly (unerupted upper canines) associated with sacral spina bifida. The marked cutaneous folds indicated well nourished subjects and the possible presence of obesity.

In conclusion, this small series represents a population in a good nutritional status, as demonstrated by the presence of caries and obesity. The coexistence of a dental and skeletal anomaly in the same subject might be related to developmental abnormalities.

Further investigations were planned, in order to obtain additional information.

Ventura L.¹, Pensiero V.², Caruso C.³, Voi G.³ and Fornaciari G.⁴

¹Department of Pathology, San Salvatore Hospital, L'Aquila, Italy.

²Department of Environmental Sciences; University of L'Aquila, Italy.

³R. S. A., "Busacca" Hospital, Scicli, Italy.

⁴Division of Paleopathology and History of Medicine and Bioethics, Department of Oncology, Transplants and Advanced Technologies in Medicine, University of Pisa, Italy.

Poster

The mummies from the church of Santa Maria della Consolazione in Scicli (South-Eastern Sicily)

Keywords: *Mummies, Paleopathology, Modern Age, Sicily.*

The church of Santa Maria della Consolazione in Scicli (south-eastern Sicily) was started to build in the XVI century and finished in the beginning of XIX century. The funerary character of the church is suggested by the name itself (consolation for the dead) and witnessed by several discoveries of crypts and human remains within the building through the years.

Consolidation works took place in 2008 and allowed to confirm the presence of 20 crypts under the church floor, containing a great number of skeletal remains and 6 mummies with coffins. A preliminary survey of the bodies enabled us to date them back to XVIII-XIX century and to establish that they belonged to 3 men and 3 women in a preservation state varying from excellent to poor. A complete paleopathologic study was proposed but, unfortunately, could not be carried out because the mummies were unaccountably reburied under the pavement.

Other remains had been discovered at the beginning of XX century and, during the Second World War, in a room beneath the frontal staircase of the building, a mummy named by local people the "Queen of the Moors" had been recovered and moved to another church, where it is still displayed in a glass/wooden case. A paleopathologic study of the subject took place in 2010, with external examination, digital radiology and CT scanning with 3D reconstructions.

The natural mummy, possibly dating back to the second half of XIX century, was in excellent state of preservation and almost complete (without feet), belonged to a well-nourished female subject with an age at death of 45-55 years. Most of the internal organs were readily recognizable. Right pleural adhesions with lung calcifications suggested primary tuberculosis. All the teeth were present, with postmortem displacements, severe dental wear and periodontitis.

Further studies are planned to obtain additional information.

Veselka B., Waters-Rist A.L. and Hoogland M.L.P.
Faculty of Archaeology, University of Leiden, the Netherlands.

Podium

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Rural rickets. Beemster, a farming community in post-medieval Netherlands

Keywords: rickets, vitamin D, the Netherlands, post-medieval, infant care.

Beemster is a rural farming community in the Netherlands which was founded in the 17th century on reclaimed land. The cemetery of Middenbeemster was situated in the central part of the village and was used from the 17th to 19th century. In 2011 about 450 skeletons were excavated of which 49 subadults from the ages of one to fifteen years were examined for rickets. In the 19th century, rickets had become epidemic in most industrialised cities throughout Northern Europe. Crude rickets prevalences in contemporaneous urban populations from the Netherlands varied from 1% to 7%. To identify this disease in the sample of Middenbeemster ten features as described by Ortner and Mays (1998) were scored. Bending deformities of the lower limbs or at least three non-bending features had to be present in order to diagnose rickets. Five individuals displayed evidence of rickets, which is 10.2% of the entire sample. This alone is a high rickets prevalence, but even more for a rural community. In addition, all the affected individuals belonged to the same age category, one to three years, so the age-specific prevalence becomes much higher at 20.0%. This is an unexpectedly high prevalence of rickets in a community where sunlight was readily available. Specific practices and activities associated with the young age of affected individuals must have diminished sunlight exposure to such a degree that their diet was not sufficient enough to replenish required vitamin D levels to prevent rickets development. Cultural practices including the swaddling of older infants, occlusive clothing for infants and children, and keeping the young indoors may have contributed to this high rickets prevalence. This study demonstrates the value of careful analysis of pathological conditions in subadults and provides information on cultural practices such as infant care and diet.

Villa C.¹, Mariotti V.^{2,3}, Milella M.⁴, Belcastro M.G.², and Lynnerup N.¹

¹Laboratory of Biological Anthropology, Department of Forensic Medicine, University of Copenhagen, Denmark.

²Laboratory of Bioarchaeology and Forensic Osteology, Department of Experimental Evolutionary Biology, Alma Mater Studiorum University of Bologna, Italy.

³Unite' Mixte de Recherche 6578 – Unite' d'Anthropologie Bioculturelle, Centre National de la Recherche Scientifique/ Université de la Méditerranée/Etablissement Français du Sang, Marseille, France.

⁴Anthropological Institute and Museum, University of Zurich-Irchel, Switzerland.

Poster

Age estimation and enthesal changes: correlation between estimation bias and robusticity in lower limb entheses

Keywords: enthesal changes, age estimation, robusticity, pubic symphysis, auricular surface.

Correlation between enthesal changes and age has been demonstrated in several studies. Mariotti et al. (2004, 2007) and Milella et al. (2012) found that age, together with sex, is the main factor contributing to the enthesal changes on the Frassetto collection of Sassari (Sardinia). In this study, a subgroup of the same collection was used to test for correlation between the enthesal changes and bias in age estimation (i.e. difference between known age and estimated age). Using the methods of Suchey-Brooks and Buckberry and Chamberlain, we estimated the age of 138 males and 124 females. The degree of robusticity (weak and strong development) on five lower limb entheses (gluteus maximus, iliopsoas, vastus medialis, quadriceps and soleus) was considered for both sexes and by considering the two sides separately. By using the method of Suchey-Brooks, we found significant bias differences in both sexes when considering the gluteus maximus, while only in females considering the iliopsoas and quadriceps (patella). Bias differences were also found using the Buckberry and Chamberlain's method. Specifically, these are significant by considering the gluteus maximus (both sexes), iliopsoas (males) and vastus medialis, soleus and quadriceps (females). Further investigations will include other enthesal changes (proliferative and resorptive enthesopathies) to the present dataset. A better understanding of the correlation between enthesal changes and age estimates may enhance the accuracy of biological profiles in both forensic anthropology and osteoarchaeology.

Villotte S.¹ and Knüsel C.J.²

¹Biological Anthropology Research Centre, Division of Archaeological, Geographical & Environmental Sciences, Phoenix SW building, University of Bradford, Bradford, West Yorkshire, BD7 1DP, UK.

²Department of Archaeology, University of Exeter, Laver Building, North Park Road, Exeter, Devon, EX4 4QE, UK.

Podium

Activity-related morphologies and the sexual division of labor during the Early Neolithic

In prehistory sexual division of labor or gendered activity, a part of gender relations that contributes to the roles that men and women play in society, is usually inferred from analyses of grave goods and artistic representations. Normally, interpretations of

this evidence depend on analogies drawn from cross-cultural studies. At present, the study of skeletal activity-related morphology seems to be the only way to directly establish the existence of such a division that characterizes almost all contemporary traditional societies. These variations, related to mechanical stresses experienced during life, were recorded in the Stuttgart-Mühlhausen (southwest Germany) collection dating from the LBK. The purpose of this paper is to present the results from an analysis of one type of activity-related morphology: upper limb enthesopathies (i.e. lesions of tendon attachments). Fifty-nine individuals (32 females and 27 males) were selected for this study. The analysis indicates very clear right-side dominance for males, but not for females. Moreover, a lesion probably related to a traumatic event occurring during movements associated with throwing motions is seen only in males. Based on this evidence we postulate the existence of a strict sexual division of labor in this population involving one or several strenuous activities linked to unilateral limb use in males.

This research was supported by a Fyssen Foundation Post-Doctoral Fellowship.

Walker R., Ikram S. and Bryan B.

Poster

An Extraordinary Interment Found in Early New Kingdom Luxor

In January 2011, Ms. Walker was asked by project director Betsy Bryan to clear a flexed burial from the industrial section of the Mut Temple complex at Karnak in Luxor. This body was said to be flexed, on its left side, head North, facing East. Initial examination of the partly-exposed body indicated that the head was indeed to the North, but actually facing North as well. In addition, the knees, although tightly flexed, were not to the front of the body and thus pointing approximately North, but actually pointing to the South. Over the following days, the body's posture became increasingly questionable, as expected elements (arm, shoulder, iliac crest of the presumed upper side) did not appear. Work was interrupted by early closure of the excavation due to political developments in Cairo.

When we returned to the site in June 2011, the authors were able to fully excavate this individual, revealing an unprecedented position, deposition (in a late Second Intermediate or early 18th Dynasty context, covered and surrounded by large amounts of pottery including Nubian sherds), and cause of death of this individual. The material, much of it excavated en bloc, was removed to the site storehouse. Detailed analysis of this individual is scheduled for early June this year,

and results presented at the conference.

Waters-Rist A.L. and Hoogland M.L.P.

Laboratory for Human Osteoarchaeology, Faculty of Archaeology, Leiden University, The Netherlands. Faculty of Archaeology, Leiden University, PO Box 9515, 2300 RA, Leiden, The Netherlands.

Podium

Osteological Evidence of Achondroplastic Dwarfism in a Nineteenth Century Dutch Family

Keywords: *achondroplasia, Netherlands, shortened stature, inheritance, post-Medieval.*

An opportunity to explore osteological and epidemiological features of achondroplastic dwarfism is presented by a recent archaeological discovery. Excavation of a predominately nineteenth century Dutch cemetery from the rural, agricultural village of Middenbeemster revealed an older adult female with classic skeletal markers of achondroplasia. The most marked features of achondroplasia are a rhizomelic pattern of shortened and thickened upper and lower limbs, frontal bossing, small thoracic and lumbar neural canals, and bending deformities (*genu vara*) of the femora and tibiae. Using the Fully anatomical method stature was reconstructed to be 130 +/-5cm. Archival data permitted identification the individual as a 66-year old female who died in 1863, who had given birth to seven children. Two of the children were stillborn, one died at three days of age, one died at the age of ten years, and the remaining three survived until adulthood. Five of the offspring were buried in the Middenbeemster cemetery and are analyzed for evidence of an inherited skeletal dysplasia. For the three perinates fragmentation of crania limits diagnostic ability, but long bones were not significantly shortened or malformed. A 10-year old daughter and 21-year old son show markedly reduced long bone lengths and delayed epiphyseal fusion, although overall morphology of the bones is normal. This combination of osteological and archival data creates a unique opportunity to track the inheritance and manifestation of a rare disease in a past population.

Wiltshcke-Schrotta K.

Department of Anthropology, Natural History Museum Vienna, Austria.

Poster

Atlas-Axis Fusion – A Case Study

Keywords: *Atlas-Axis Fusion, Celts.*

From a burial chamber of a Latène period grave (2400BP) from Hallein Dürrenberg/ Austria, remains

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of at least seven individuals were recovered. Most of the skeletal parts were in a bad condition and the bones were commingled. Attempts to assign bones to single individuals were undertaken but are still arguable. Only a few vertebrae from at least two adult individuals were present. The skeletal parts of HD 150-2 probably belonged to a 30-40 year old male. The fourteen lumbar and thoracic vertebrae articulate well and show some degenerative signs like osteophytes on the rims of the vertebral bodies and a retraction of the body. The cervical vertebrae have a similar state of preservation but their association with this individual remains unclear.

The second cervical vertebrae (Axis) and the left half of the first vertebrae (Atlas) are fused. The top of the dens axis has an angle of 45° backwards and 60° to the left side. The adjoining facet is on the anterior part of the foramen magnum and shows a sharp curb which might imply that skull rotation was limited. There is a small loose right part of the first vertebrae with a joint to the condylus occipitalis, an intervertebral joint facet with C2 and an accessory small joint facet articulating with the dens axis. The purpose of this paper is to discuss this malformation. Was it a developmental disorder, an early trauma, or is it due to an erosive arthropathy. Further the impact of this defect on daily life of this individual will be reconstructed.

Winter E.¹, Patzak B.¹ and Teschler-Nicola M.^{1,2}

¹Department of Anthropology, Natural History Museum Vienna

²Department of Anthropology, University of Vienna.

Poster

Stone by stone: the body-stone collection of the “Pathologisch-anatomische Sammlung im Narrenturm – Naturhistorisches Museum Wien” (PASiN – NHM*)

Body-stones, crystal aggregations of organic- and mineral-salts, are clinically frequently observed. They are found in many organs and glands and differ conspicuously in form and size. Such stones are typically classified by their location (e.g., bladder, prostate, kidney, renal pelvis, ureter, gallbladder, bile duct, pancreas, parotid-, submandibular- and sublingual glands) or chemical composition (e.g., cholesterol gallstones, pigment gallstones; struvite kidney stones, calcium containing kidney stones, oxalate kidney stones, uric acid kidney stones). The formation of body-stones is often associated with life style and dietary factors and practices, e.g., inadequate fluid intake; several stones originate from inherited metabolic disorders, or are related to infectious or chronic diseases; moreover, there is some evidence that pregnancy-related changes

increase the risk of stone-building.

Although such solid concretions are prevalent in modern populations, they have rarely been documented in archaeological contexts. This phenomenon seems to be unlikely and may be affected by the complicacy of identifying these objects during the archaeological excavation. Here, we present and discuss the variable specimens of these “internal artworks” (Ilana Halperin, 2012) in a comprehensibly manner to improve the scopes of an in-situ diagnosis by archaeologists. Among the selected and investigated sample are body-stones collected by Leopold von Dittel, a famous Austrian surgeon of the 19th century, who made special studies of urinology (Schönbauer 1959). All are housed at the Pathological-anatomical collection at the fool’s tower, Natural History Museum Vienna (PASiN-NHM), where also the past medical histories are preserved.

* Since 1st January 2012 the PASiN became unified with the Department of Anthropology at the Natural History Museum Vienna.

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Zago M., Marinato M., Chavarria Arnau A. and Canci A.

Dipartimento dei Beni Culturali: Archeologia, Storia dell’Arte, del Cinema e della Musica - Università degli Studi di Padova.

Poster

A bioarchaeological approach on late medieval Venice area: new results about health status and occupational activities from Campagna Lupia

Keywords: *bioarchaeology, Campagna Lupia, Venice, late medieval period, health status.*

This paper was carried out with the aim of updating the study presented in the last European PPA meeting held in Wien in 2010 about the bioarchaeological analysis of human skeleton remains from the medieval cemetery of Campagna Lupia, a little village in the Venice area. The good state of preservation of the skeletal material has made it possible to determine sex and age at death for the majority of individuals. The human bones remains belongs to 75 individuals,

14 males, 15 females, 6 adults of unknown sex and 40 sub-adults; mortality is observed predominantly in age groups between 0-3 years and 3 -12 years, similarly with other Italian medieval cemeteries.

Dental pathologies as caries, ante mortem tooth loss and abscesses, were found in several subjects, and were probably related to a monotonous diet based on a low protein intake and on a high consumption of cereals, as is confirmed besides by the presence of disease correlated with anaemia.

In addition, evidences of infectious disease consisted in probable lesions due to meningitis, maxillary sinusitis and severe erosions of thoracic vertebral bodies suggesting probable brucellosis affected respectively child and adults skeletons.

The study of skeletal indicators of occupational activities shows strong muscular insertions and the evidences of biomechanical stress as enthesopathies, Schmörl nodules and traumatic injuries as clay shoveller's fracture indicates fatiguing activities.

In conclusion, these new results further supports the previous hypothesis of poor health conditions and daily strenuous job involving this little village of peasants of late medieval Venice area.

Zanatta A.¹, Thiene G.¹, Liessi G.², Basso C.¹, Barbieri C.³, Rippa Bonati M.¹ and Zampieri F.¹

¹Department of Cardiac, Thoracic and Vascular Science, University of Padua, Italy.

²C.M.S.R. Veneto Medica, Italy.

³Department of Astronomy, University of Padua, Italy.

Podium

The Fifth Lumbar Vertebra of Galileo Galilei in Padua University

Keywords: *Galileo's vertebra; anthropological analyses; CT scan; rheumatic disease.*

In 1737, Galileo's remains were exhumed to be placed in a Mausoleum in Santa Croce in Florence dedicated to him. During the operations of exhumation some "relics" has been removed from the Galileo's skeleton. One of them, the fifth lumbar vertebra, is still conserved in Padua University.

In 2010, team members of the Juno mission of NASA advanced the proposal to embark a fragment of Galileo's vertebra in the spacecraft that will be in the orbit around Jupiter, surrounded by the moons that Galileo himself discovered. NASA request gave us the occasion to pull out the vertebra from the strongbox where it has been located since years.

Galileo suffered from several diseases during his life. From his correspondence, we read that he complained about different disorders related to rheumatism, kidney stones, haemorrhoids, inguinal hernia and arrhythmias. A study of Galileo's vertebra might give some new insights about the pathologies that affected the scientist during his life, in particular the blindness that started from 1637. In fact, it seems that his blindness could be related with a form of immune rheumatic disease. By consequences, we made anthropological analyses and CT scan of the vertebra to detect any eventual presence of signs of arthritis. The result will be discussed in this paper.

Zinchenko R., O'Grady J. and Donoghue H.D.

Department of Infection, University College London, London, UK.

Poster

Genetic lineage of *Mycobacterium tuberculosis* in Medieval Nubia

Keywords: *Ancient DNA, molecular investigation, Mycobacterium tuberculosis, real-time PCR.*

Tuberculosis (TB) is a highly transmissible disease and the World Health Organisation estimates a third of the world population is infected with the tubercle bacillus. The disease results from exposure to any of the species of the MTB complex (e.g. *M. tuberculosis*, *M. africanum*, *M. bovis*), with most human cases caused by *M. tuberculosis* (MTB). After exposure to MTB approximately 5% of infected people develop active disease and many others remain latently infected, indicating a long-term relationship between MTB and its human host. To investigate TB in antiquity a population from Kulubnarti, in the northern part of modern day Sudan, was studied. Human remains were naturally mummified, due to an almost total absence of rainfall in the region. Fluorine analysis dated the individuals to the 6th-15th centuries. Gross pathological changes to the skeleton are well recognized in TB paleopathology, yet bone infection is rare and even in the absence of chemotherapy, occurs in only around 5% of cases. Therefore, the detection of MTB ancient DNA (aDNA) is a more robust marker of the occurrence of infection. On-going aDNA studies indicate that almost one-third of this population were infected with TB, although the DNA appears highly fragmented. Nubia was a trading partner of ancient Egypt, where both MTB and *M. africanum* have been identified. To explore TB epidemiology in this region, the presence or absence of the TbD1 deletion locus was determined, to distinguish MTB from other members of the MTB complex. Specific fluorescent probes in

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quantitative real-time PCR enable the detection of highly fragmented aDNA. A 62-bp sequence internal to TbD1 and a 64-bp sequence flanking the deletion region enabled TbD1 intact or deleted strains to be distinguished. This methodology demonstrated that a lower rib from a five-year-old child, positive for TB, was infected with MTB from a TbD1-deleted lineage.

Lille, France

August 27 - 29, 2012

LIST OF PARTICIPANTS

The 19th european meeting of the paleopathology association

Participants registered for the 19th european meeting of the paleopathology association (updated August 14th 2012)

First name	Last name	Email
Adewale Olorunjueda	ADEBOWALE	silralphlimited@gmail.com
Segun Tope Prince	ADEKOYA	laofadnig@yahoo.com
Elin	AHLIN SUNDMAN	elin.as@fobs.se
caroline	AHLSTRÖM ARCINI	caroline.arcini@raa.se
Evilena	ANASTASIOU	ea333@cam.ac.uk
Oussama	BAKER	oussamareha@yahoo.com
Joaquim	BAXARIAS	outplant.menarini@amexbarcelo.com
Michael Allen	BECK DE LOTTO	m.delotto@tiscali.it
Jelena	BEKVALAC	jbekvalac@musuemoflondon.org.uk
Pia	BENNIKE	piabennike@gmail.com
Zsolt	BERECZKI	bereczki.zsolt@bio.u-szeged.hu
Zsolt	BERECZKI	bereczki.zsolt@gmail.com
Nataliya	BEREZINA	berezina.natalia@gmail.com
Birgit	BERK	birgitberk@hotmail.com
Benoit	BERTRAND	bbertrand@douaisis-agglo.com
Raffaella	BIANUCCI	raffaella.bianucci@unito.it
Michaela	BINDER	michaela.binder@durham.ac.uk
Annelise	BINOIS	annelise.binois@mae.u-paris10.fr
Joël	BLONDIAUX	jblondiaux@nordnet.fr
Ceridwen	BOSTON	ceri.boston@linacre.ox.ac.uk
Isabelle	BOUCHEZ	ysabouchez@live.fr
Abigail	BOUWMAN	abigail.bouwman@uzh.ch
Hannah	BRADLEY	hrbradley@yahoo.com
Megan	BRICKLEY	brickley@mcmaster.ca
Andrea	BUCK	abuck4@cox.net
Bruce	BUCK	bbuck4@cox.net
Hallie	BUCKLEY	hallie.buckley@anatomy.otago.ac.nz
Jane	BUIKSTRA	buikstra@asu.edu
Alexandra	BUZHILOVA	albu_pa@mail.ru
Alessandro	CANCI	acanci@gmail.com
Haim	COHEN	haimcoh1@bezeqint.net
Thomas	COLARD	thomas.colard-2@univ-lille2.fr
Della Collins	COOK	cook@indiana.edu
Hélène	COQUEUGNIOT	h.coqueugniot@pacea.u-bordeaux1.fr
Cassandre	COUDERT	cassandre.coudert@etu.univ-lille2.fr
Davina	CRAPS	d.d.craps@durham.ac.uk
Francisco	CURATE	fcurate@uc.pt
Gali	DAR	galidar@yahoo.com
Hans	DE BOER	hanshdeboer@gmail.com
Amélie	DE BROUCHER	ameliedebroucker@hotmail.fr
Nathalie	DELHOPITAL	nathaliedelhospital@yahoo.fr

Xavier	DEMONDION	xavierdemoncion@yahoo.fr
Alma	DEPREUX	alma.depreux@gmail.com
William	DEVRIENDT	wdevriendt@douaisis-agglo.com
Helen	DONOGHUE	h.donoghue@ucl.ac.uk
Benjamin	DUFOUR	benjamin.dufour@univ-fcomte.fr
Olivier	DUTOUR	olivier.dutour@ephe.sorbonne.fr
Christos	ECONOMOU	christos.economou@arklab.su.se
Ilaria	FARINA	lestat.86@hotmail.it
Michal	FELDMAN	michalfe@gmail.com
René-Marc	FLIPO	rmflipo@chru-lille.fr
Gino	FORNACIARI	gino.fornaciari@med.unipi.it
Katharina	FUCHS	Katarfu@gmail.com
Hisashi	FUJITA	RXH05535@nifty.com
Jessica	GALEA	arjcg@bristol.ac.uk
Elsa	GAROT	e.garot@hotmail.fr
Jonny	GEBER	jonny.geber@cotswoldarchaeology.co.uk
Nia	GIANNAKOPOULOU	nia.giannakopoulou@gmail.com
Anne	GRAUER	agrauer@luc.edu
Julia	GRESKY	jgr@dainst.de
Kurt, Leopold	HAAS	kurt.haas@telia.com
Jessica	HENDY	jessica@eurotast.eu
Estelle	HERRSCHER	herrscher@mmsch.univ-aix.fr
Israel	HERSHKOVITZ	anatom2@post.tau.ac.il
cecilie	HONGSLO VALA	cecilie_vala@hotmail.com
Menno	HOOGLAND	m.l.p.hoogland@arch.leidenuniv.nl
Jean-Bernard	HUCHET	huchet@mnhn.fr
Alena Mayo	INIGUEZ	alena@ioc.fiocruz.br
Beata	IWANEK	biwanek@tlen.pl
Lauren	JAEGER	laurenhj@hotmail.com
Tina	JAKOB	betina.jakob@dur.ac.uk
Rimantas	JANKAUSKAS	rimantas.jankauskas@mf.vu.lt
Blandyna	JERSZYNSKA	blandyna@amu.edu.pl
Andrew	JONES	akgjones@googlemail.com
Hedy	JUSTUS	hedy.justus@jpac.pacom.mil
Sacha	KACKI	sacha.kacki@inrap.f
Fabian	KANZ	Fabian.Kanz@meduniwien.ac.at
Sylva	KAUPOVA	kudlackova.sylva@seznam.cz
Christine	KELLER	heck_k@hotmail.com
Myeung Ju	KIM	mjukim99@dankook.ac.kr
Yi-suk	KIM	jwkiss@ewha.ac.kr
Gary	KING	g.a.king@durham.ac.uk
Anna	KJELLSTRÖM	anna.kjellstrom@ofl.su.com
Lea-Louisa	KLEMENT	leloukle@gmail.com
Nadja	KOMNENIC	nadjakomnenic@gmail.com

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Simone	KRAIS	simone_krais@eva.mpg.de
Magdalena	KRAJEWSKA	krajewska84@gmail.com
Marta	KRENZ-NIEDBALA	martak@amu.edu.pl
zita	LAFFRANCHI	zitina82@gmail.com
Laëtitia	LANTERI	laetitialanteri@yahoo.fr
Laetitia	LAQUAY	laetitia.laquay@gmail.com
Matthieu	LE BAILLY	matthieu.lebailly@univ-fcomte.fr
Gordon	LE ROUX	gmleroux@doctors.org.uk
Oona	LEE	leeoy@bham.co.uk
Lucille	LEGER	lucille.l@wanadoo.fr
Guido	LOMBARDI	guido_lombardi@hotmail.com
Sandra	LÖSCH	sandra.loesch@irm.unibe.ch
Tess	LUETCHFORD	tkingham@btopenworld.com
Sylwia	LUKASIK	lukasik@amu.edu.pl
Niels	LYNNERUP	nly@sund.ku.dk
George	MAAT	G.J.R.Maat@LUMC.NL
Bahaa	MADLEG	bahaamedlej@gmail.com
Giovanni	MAGNO	magno_giovanni@yahoo.com
Frank	MAIXNER	frank.maixner@eurac.edu
Keith	MANCHESTER	manchester.keith@ymail.com
Antonia	MARCSIK	gypalfi@hotmail.com
Maurizio	MARINATO	maurizio.marinato@gmail.com
Maria	MARSCHLER	maria@marschler.at
Gerard	MARTIN	doct-gerard.martin@wanadoo.fr
Hila	MAY	hilamay@gmail.com
Aurélie	MAYER	aurelie.mayer@eveha.fr
Elissa	MENZEL	ecmenzel@me.com
Christian	MEYER	meyerc@uni-mainz.de
Dimitra-Ermioni	MICHAIL	emimi1306@hotmail.com
francesca b m	MIGLIACCIO	arfbmm@bristol.ac.uk
Zydrune	MILIAUSKIENE	zydrune.miliauskiene@mf.vu.lt
David	MINNIKIN	d.e.minnikin@bham.ac.uk
Piers	MITCHELL	pdm39@cam.ac.uk
Negahnaz	MOGHADDAM	negahnaz.moghaddam@irm.unibe.ch
Erika	MOLNAR	molnar.era@hotmail.com
Konstantinos	MOUNTRAKIS	c.mountrakis@gmail.com
Cristina	MUJA	cristina.muja@gmail.com
Anna	MYSZKA	myszanka@amu.edu.pl
Stephan	NAJI	stephan_naji@hotmail.com
Andreas	NERLICH	Andreas.Nerlich@extern.lrz-muenchen.de
Maria João	NEVES	mjoao.neves@dryas.pt
Nicole	NICKLISCH	n.nicklisch@uni-mainz.de
Friederike	NOVOTNY	friederike.novotny@nhm-wien.ac.at
Dariusz	NOWAKOWSKI	darekn@hotmail.pl

Alan	OGDEN	arogden@bradford.ac.uk
Chang Seok	OH	oxman@nate.com
Laszlo	PAJA	bereczki.zsolt@gmail.com
György	PALFI	gypalfi@hotmail.com
Doris	PANY-KUCERA	doris.pany@nhm-wien.ac.at
Anastasia	PAPATHANASIOU	anastasia.papathanasiou@uth.gr
Joshua	PECK	joshua.peck@jpac.pacom.mil
Geneviève	PERREARD	genevieve.perreard@unige.ch
Anja	PETAROS	anja.petaros@yahoo.com
Janusz	PIONTEK	piontek@amu.edu.pl
Kimberly	PLOMP	k.a.plomp@durham.ac.uk
Caroline	POLET	caroline.polet@sciencesnaturelles.be
Paola	PONCE	paolavponce@hotmail.com
Zrinka	PREMUZIC	zpremuzic@inantro.hr
Maria Letizia	PULCINI	marialetziapulcini@gmail.com
Kim	QUINTELIER	kimquintelier@hotmail.com
Emma	RABINO-MASSA	emma.rabino@unito.it
Anna	RASSKAZOVA	ateh@rambler.ru
Maité	RIVOLLAT	maite.rivollat@etu.u-bordeaux1.fr
Gwendolyn	ROBBINS SCHUG	Robbinsgm@appstate.edu
Charlotte	ROBERTS	c.a.roberts@durham.ac.uk
Cecilia	ROSSI	cecilia.rossi@unipd.it
Franck	RUHLI	frank.ruhli@anatom.uzh.ch
Jaap	SAERS	jaap.saers@gmail.com
Michael	SANDHOLZER	a.parker.3@bham.ac.uk
Ana Luisa	SANTOS	alsantos@antrop.uc.pt
Rachel	SCHATS	r.schats@arch.leidenuniv.nl
Holger	SCHUTKOWSKI	hschutkowski@bournemouth.ac.uk
Roger	SEILER	roger.seiler@anatom.uzh.ch
Tatiana	SELLA- TUNIS	tanechka1@gmail.com
Dong Hoon	SHIN	cuteminjae@gmail.com
Tatiana	SHVEDCHIKOVA	tashved@gmail.com
Lemmers	SIMONE	s.a.m.lemmers@arch.leidenuniv.nl
Viviane	SLON	v_slon@yahoo.com
Michaela	SPANNAGL-STEINER	michaela.spannagl@nhm-wien.ac.at
Nivien	SPEITH	nivien@mac.com
Mark	SPIGELMAN	spigelman@btinternet.com
Sabine	STEN	sabine.sten@hgo.se
Maryna	STEYN	maryna.steyn@up.ac.za
Rebecca	STORM	Storm333@btopenworld.com
Elaine	SWANEPOEL	eswanepoel@uj.ac.za
Maria	TESCHLER-NICOLA	maria.teschler@nhm-wien.ac.at
Anne-marie	TILLIER	am.tillier@pacea.u-bordeaux1.fr
Svetlana	TUR	tursvetlana@mail.ru

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Cláudia	UMBELINO	umbelino@antrop.uc.pt
Lida	VAN DER MERWE	a.e.vandermerwe@amc.uva.nl
Sophie	VATTEONI	svatteoni@douaisis-agglo.com
Luca	VENTURA	luca.ventura@tin.it
Gallien	VERONIQUE	veronique.gallien@inrap.fr
Barbara	VESELKA	barbaravanmaren@gmail.com
Chiara	VILLA	chiara.villa@forensic.ku.dk
Roxie	WALKER	rw.instbio@gmail.com
Sofia	WASTERLAIN	sofiawas@antrop.uc.pt
Andrea	WATERS-RIST	a.l.waters@arch.leidenuniv.nl
Karin	WILTSCHKE-SCHROTTA	karin.wiltschke@nhm-wien.ac.at
Houdini Ho-Tin	WU	o.y.lee@bham.ac.uk
Marina	ZAGO	marina_zago@hotmail.it
Ruslan	ZINCHENKO	bwall90@gmail.com
Albert	ZINK	Albert.Zink@eurac.edu

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