International Council for Archaeozoology Animal Palaeopathology Working Group

Animal diseases in past human societies

Provisional abstract booklet

April 9-11 2010
Hecabe Congress Centre, Katerini, Pieria, Greece
Conference Abstract

The transmission and impact of animal disease is a critically important issue in contemporary society. Amongst domestic livestock, disease and poor animal health can profoundly affect local, regional and global economies. In wild animals, disease can not only significantly affect population numbers, but can alter ecosystems and threaten biodiversity. Transmissible animal diseases (zoonoses) account for high levels of sickness and mortality rates in both human and animal populations in many parts of the world, while recent history has demonstrated the profound psychosocial impact caused by the fear of zoonotic disease, let alone the reality of living alongside it.

The impact of animal disease in pre-industrialised societies, where human-animal relationships were much more closely entwined, must have been equally, if not more, profound. Yet, despite calls for the development of animal palaeopathological studies since the early 20th century there are still many aspects of the discipline that are poorly understood. The aim of this inter-disciplinary conference is to bring together researchers from around the world to explore and discuss the archaeological, historical and clinical evidence for animal disease in the past.

Organising Committee

Theo Antikas (Department of History, University of Washington (ret.), USA)
Robin Bendrey (CNRS, Muséum National d'Histoire Naturelle, Paris, France)
Linas Daugnora (Department of Anatomy and Physiology, Lithuanian Veterinary Academy, Lithuania)
Ylva Telldahl (Department of Archaeology and Classical Studies, Stockholm University, Sweden)
Richard Thomas (School of Archaeology and Ancient History, University of Leicester, UK)
Fay Worley (English Heritage, Portsmouth, UK)

Sponsors

Mayor of Katerini
Prefect of Pieria

Mt. Olympus in the spring (photograph taken by Theo Antikas)
Scientific programme

Friday April 9

Conference opening

- 0930-1030: Conference registration
- 1030-1100: Opening addresses and retrospective

Methodological considerations – chaired by Professor Don Brothwell

- 1100-1130: Don Brothwell – The problem of discriminating conflict and hunting injuries from infections
- 1130-1200: Conni Lord – What’s mine is yours: a histological investigation into the parasites shared between man and beast in ancient Egypt
- 1200-1230: Clare Randall – Standing out from the herd? Integrating palaeopathology and identifying changing husbandry in an Iron Age landscape
- 1230-1330: Lunch

Infectious diseases – chaired by Professor Don Brothwell

- 1330-1400: Elizabeth Uhl – On the origins of disease: evolution and the impact of animal diseases
- 1400-1430: Jeanette Wooding – Humans and animals: a deadly combination? The application of skeletal lesion patterning and differential diagnosis to the study of a zoonotic disease
- 1430-1500: Robin Bendrey – Close encounters: exploring disease ecology among nomadic pastoral cultures on the later prehistoric Central Asian Steppe
- 1500-1530: Tim Newfield – Disease outbreaks among cattle in medieval Europe: a survey of the written evidence and future directions
- 1530-1540: Chair’s summary
- 1540-1600: Tea/coffee

Practical workshop

- 1600-1800: Conference attendees are encouraged to bring along ‘interesting’ or ‘challenging’ pathological specimens for discussion. There will also be the opportunity to diagnose a fourth-century BCE horse recovered from Pydna!

Saturday April 10

Poster presentations (0930-1030)

- Silvia Albizuri, Matias Fernandez and Lluis Lloveras – Using palaeopathological evidence to assess the economic importance of horses in the north-east part of the Iberian Peninsula during the early Iron Age
• Harriet Brooks, A. Goodman and B. J. Colston – Investigating responses of archaeological bone to post-retrieval environment
• Georgios Foutsitzis – The contribution of bioarchaeology and its role in the detection of ancient diseases
• Erika Gál – Animal bone remains displaying pathological conditions from the Turkish Period Castle of Barcs in south-western Hungary.
• Louisa Gidney – Murrain of livestock and outfield cultivation
• Matilda Holmes – Ploughing on: more adventures with pathological changes in cattle phalanges
• Lluís Lloveras and Richard Thomas – Rabbiting on about disease: pathologies in a population of Oryctolagus cuniculus from a British archaeological site
• Patricia Maita - Labour's diseases in the bones of pack animals. A view from the legs of prehispanic camelid herds in Peru
• Patricia Maita - Diseased mice: implications for human health at the Inca site of Pueblo Viejo, Peru
• Ninna Manaseryan – Unhealthy and traumatic bone lesions in Bronze Age mammals from Armenia
• Lidar Sapir-Hen, Guy Bar-Oz, Ilan Sharon, and Tamar Dayan – Healed bone fractures in dog burials from the Persian period at Tel Dor, Israel
• Richard Ward and Jacqui Mulville – Osteochondrosis in cattle: an initial study
• Fay Worley and Simon Mays - Using palaeopathological evidence to interpret animal bone deposits: a cattle hide from Groundwell Roman Villa, Swindon

**Site-based case studies — chaired by Dr László Bartosiewicz**

• 1030-1100: Eleni Samartzidou – Animal palaeopathology at the Neolithic lakeside settlement of Dispilio (prefecture of Kastoria), north-western Greece
• 1100-1130: Maaike Groot – Animal health in the rural civitas Batavorum
• 1130-1200: Tyr Fothergill – Pathological turkeys from the Bluff Great House, Utah
• 1200-1230: Stephanie Vann – Abnormalities of post-medieval sheep metapodia
• 1230-1330 Lunch

**Pathologies of individual species – chaired by Dr Theo Antikas**

• 1330-1400 László Bartosiewicz – Diachronic differences in appraising horse morbidity
• 1400-1430: Theo Antikas – Palaeopathology in Greek horses from Homeric to Hellenistic times
• 1430-1500: Anne Karin Hufthammer and Linas Daugnora – Analysis of skeletal pathologies in modern and Viking Age horses from Norway
• 1500-1530: Maciej Janeczek, Aleksander Chróśczz, Zora Miklíková, and Marian Fabiš – Pathological changes in the hind limb of a horse from the Roman Period
• 1530-1600 coffee/tea
• 1600-1630: Ylva Telldahl – Pathological changes on cattle calcaneus from Viking Age settlements in Sweden
• 1630-1700: Lluís Lloveras, Richard Thomas, Marta Moreno-García, Jordi Nadal, Xavier Tomàs-Gimeno and Carme Rissech – Pathological study of modern rabbit remains: a reference case to be applied to the analysis of archaeological rabbit assemblages
1700-1730: Jessica M. Grimm – Occipital dysplasia in dogs: the archaeological evidence
1730-1740: Chair’s summary

APWG committee meeting (1740-1800)

Conference dinner (1930)

Sunday April 11

Excursion to the Royal tombs of Vergina (0900)

The Royal tombs of Vergina (Fig. 1) are situated close to the site of ancient Macedonian site of Aigai, which was once the royal capital of ancient Macedon. The site is thought by some to be the final resting place of Alexander the Great’s son (Alexander IV) and his father, Phillip of Macedon. A bus will be provided by the prefecture at 0900 and will leave from the central square in Katerini. The journey will take approximately one hour. After a tour around the museum and tombs at Vergina we will have lunch and return to Katerini.

Entrance to the ‘Tomb of the Prince’ (Alexander IV) at Vergina (photograph taken by Peter Nelson)
Abstracts (organised alphabetically)

Title: Using palaeopathological evidence to assess the economic importance of horses in the north-east part of the Iberian Peninsula during the early Iron Age

**Author(s):** Silvia Albizuri (Departament de Geografia, Història i Història de l’Art, Universitat de Girona, Spain), Matias Fernandez (608 Veterinary Group, Solihull, UK) and Lluís Lloveras (Departament de Prehistòria, Història Antiga i Arqueologia, Universitat de Barcelona, Spain)

**Abstract:** Zooarchaeological studies from the early Iron Age site of ‘Can Roqueta’ in Catalonia (NE Iberia) dated between approximately 725-575 BC, indicated that horses were used for riding and traction until old age. Wear patterns on the molar teeth suggested a grain-rich diet. Several pathological conditions on the limb and skull bones can be associated with both lifestyle and feeding habits. Here we present new data obtained from the study of a complete horse skeleton recovered from this site. These show considerable exostoses in the scapular girdle and in the forelimb bones as well as in the last thoracic and first lumbar vertebrae. These pathological conditions indicate continuous muscular stress. Macroscopic examination of bone lesions undertaken from an equine veterinarian point of view indicates that this horse was used until a very old age in order to maximize its exploitation. This is, we suggest, clear evidence for the importance of horses in the early Iron Age economy of the Iberian Peninsula.

Title: Palaeopathology in Greek horses from Homeric to Hellenistic times

**Author(s):** Theodore G. Antikas (Department of History, University of Washington (retired), USA)

**Abstract:** The ancient burial habit of heroes thrown in the pyre with horses and dogs, first reported by Homer in the Iliad, fortunately continued in Archaic, Classical, Hellenistic, and Roman periods in Greece. This has provided a great opportunity to analyze equine skeletal remains unearthed in archaeological digs between 1993 and 2008. Palaeopathologies observed in horse skeletons dating from the Mycenaean era (Argos) to the Hellenistic and Roman periods (Akanthos, Langadas, Polykastro, Sindos and Therme) are presented in this paper, summarising 15 years of accumulated knowledge.

Title: Diachronic differences in appraising horse morbidity

**Author(s):** László Bartosiewicz (Institute of Archaeological Sciences, Loránd Eötvös University, Hungary)

**Abstract:** In Hungary, information regarding the palaeopathology of horses varies through time as a consequence of different cultural attitudes to these animals. While ancient human behaviour is an important topic of study, it becomes a form of noise in palaeopathology. The representation of lesions in four types of deposits will be compared:

1 – AD fifth–eighth century Migration period horse burials have yielded complete skeletons. These offer multiple, high resolution data, unrivalled by the remains of other domesticates, except dog;
2 - Although the so-called “horse skin” burials of the ninth century Hungarian Conquest are less numerous and contain only skulls and dry limb bones, the age, sex and stature can still be estimated and used in reconstructing the health status of animals;

3 - The pastoral tradition of eating horses survived in Hungary for generations during the eleventh-thirteenth century, in spite of the development of sedentism and adoption of Western Christianity. However, fragmentary horse bones recovered from kitchen refuse at rural settlements offer only a form of random representation for pathological phenomena;

4 - Following the thirteenth century Mongol Tartar incursions, horse meat eating was abandoned. Late medieval evidence originates almost exclusively from mounts or draught horses skinned and disposed off in peripheral areas.

The paper will review the effect of this selective representation on appraising and interpreting the health status of horses in medieval Hungary.

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Title: Close encounters: exploring disease ecology among nomadic pastoral cultures on the later prehistoric Central Asian Steppe

Author(s): Robin Bendrey (CNRS, Muséum National d'Histoire Naturelle, Paris, France)

Abstract: Changes in disease ecology and the incidence of infectious diseases affecting humans and animals will have been important consequences of domestication and later changes in human-animal relationships. Through prehistory, changes in cultural, social and environmental variables will have impacted upon the epidemiology of infectious diseases. In the later prehistoric Eurasian steppe, with the emergence of nomadic pastoralism, we see developments that not only had major social repercussions, but also brought about changes in the relationship between humans and animals. Ethnographic data on recent mobile pastoral groups in this region demonstrate the degree to which such cultures live in close associations with their animals, and are highly dependent on their products. This paper will consider available archaeological, ethnographic and epidemiological studies to explore the factors affecting the impact of infectious disease on the later prehistoric nomadic pastoral societies of Central Asia.

Title: The problem of discriminating conflict and hunting injuries from infections

Author(s): Don Brothwell (Department of Archaeology, University of York, York, UK)

Abstract: This paper will explore the challenges posed by the discrimination of conflict and hunting injuries from infections, with special reference to a Roman horse from Lincolnshire.

Title: Investigating responses of archaeological bone to post-retrieval environment

Author(s): Harriet Brooks, A. Goodman and B. J. Colston (Department of Pathology and Infectious Diseases, Royal Veterinary College, Hatfield, UK)

Abstract: Archaeological bones are an irreplaceable resource, especially with interest in newer molecular study techniques. Whilst burial environments predictably affect mineral and protein contents and the physical integrity of retrieved bones, effects of post-retrieval environment are not well characterised, and curatorial guidelines are non-specific.
The established Oxford histological Index (OHI) was used with a novel application of a mechanical competence test to link preservation state of archaeological bones to responses to fluctuating relative humidity (RH) in a simulated post-retrieval environment.

Archaeological ovine metapodials were classified as physically ‘poor’, ‘medium’ and ‘well-’ preserved. Resin-embedded thin sections of each bone were examined histologically; neighbouring segments were subjected to low force hardness (Vickers ‘micro-hardness’) testing. Adjacent segments were then exposed to fluctuating RH in a controlled environment, after which histology and micro-hardness testing were again performed.

Initial preservation states reflected collagen retention, with ‘best preserved’ bones having most collagen. The ability to withstand fluctuating RH was inversely related to collagen-retention, with cracking (gross and micro-) more likely in better preserved bones. Similarly, micro-hardness tended to decrease in better preserved bones after exposure to fluctuating RH; an effect not echoed by poorer preserved bones. The differing resilience of the bones may relate to hygroscopicity of collagen, also to facilitation of microbiological growth by fluctuating RH in better preserved bones.

This project is part of ongoing investigations into post-retrieval deterioration of archaeological bone and in the longer term aims to aid curators to provide optimal environments for bones in their care.

Title: Pathological turkeys from the Bluff Great House, Utah

Author(s): Brooklynne Fothergill (School of Archaeology and Ancient History, University of Leicester, Leicester, UK)

Abstract: Recent analysis of the faunal remains from the Bluff Great House, a Chacoan Great House (occupied AD 1075-1150) in south-eastern Utah, USA revealed a number of pathological bones. The majority of these were observed in domesticated turkeys (Meleagris gallopavo). The purpose of this presentation is to detail the nature of these lesions, since pathologies in turkeys have rarely been reported previously. While most of the pathologies have multiple aetiologies, some of them may reflect upon human behaviour.

A well-healed spiral fracture is present in the distal portion of a turkey tibiotarsus. This specimen exhibits minimal displacement in a bone that would have received little in the way of support from the fibula as an anatomical splint. Though there is no evidence for direct human intervention in the case of injured turkeys, it is possible that indirect care took place, perhaps in the form of protection from predation. As no investigation of human intervention in the healing of long bone fractures have been carried out on avian remains, any tentative conclusions with reference to this specimen remain speculative. Also of interest are two ulnae which have been broken in a compound fashion mid-diaphysis. The infections present in the lesions were active at the time of death. This type of break is unlikely to have occurred in the wild or in competition with other turkeys and the fractures do not resemble those resulting from a carnivore attack. It is speculated that these injuries may have resulted from a form of control when penning or tethering was not possible.

Title: The contribution of bioarchaeology and its role in the detection of ancient diseases
Author(s): Georgios Foutsitzis (Technologist of Medical Laboratories, Katerini, Greece)

Abstract: The purpose of this poster is to present two case studies that showcase the importance of bioarchaeology. In the first case, four representative scourges are reported, together with the possible causes of the diseases. In the second case the role of bioarchaeology in contributing to debates concerning the evolution of the human lineage is explored. This research demonstrates the importance of co-operation between bioarchaeology and clinicians.

Title: Animal bone remains displaying pathological conditions from the Turkish Period Castle of Barcs in south-western Hungary

Author(s): Erika Gál (Archaeological Institute of the Hungarian Academy of Sciences, Hungary)

Abstract: Excavations at the Turkish Period Castle of Barcs undertaken 1989-1994 yielded the most abundant animal bone assemblage from this period in Hungary. Almost 10,000 remains from a number of domestic and wild species were found in features deposited between 1567-1664, when roughly 170-200 Turkish watchers inhabited the castle and provided the landing stage on the bank of the River Drava.

Cattle bones dominated the assemblage, comprising 76% of the remains. They were followed by domestic hen (10%), and sheep and goat (9%) in frequency. In accordance with the feeding habits of the Muslim population, pig contributed towards only 0.5% of meat provision. Other domestic animals as well as wild species each yielded less than 1% of the remains.

A number of pathological conditions could be recognized in the assemblage. The majority of them represent mechanical lesions (domestic hen), exostoses due to the inflammation of joints (domestic hen), overstrain (cattle), old age (dog), and oligodonty (cattle).

Title: Murrain of livestock and outfield cultivation

Author(s): Louisa Gidney (Department of Archaeology, University of Durham, Durham, UK)

Abstract: The Anglo-Saxon chronicle gives a broad indication of the incidence of catastrophic collapses of domestic animal populations, usually cattle, attributed to murraín, or epidemic disease, in medieval England. Episodes only 20 years apart may be described as “not within living memory” to emphasise the severity of the disaster.

Periodic, but short-term, arable cultivation of areas of manorial waste appears to have occurred at similar frequencies. Cultivation of the waste could be a response to the aftermath of murraín, a way of raising cash to restock and use rough grazing profitably in the absence of grazing livestock, especially as such crops were not subject to tithe.

Estate management texts, such as Walter of Henley, give details for the disposal of fallen stock, indicating that the manorial system had procedures in place for dealing with such eventualities, even if these were outside living memory.

Recognising mass mortality in the archaeological record depends on large scale investigation to locate appropriate features. The burial pit at Shapwick is a recent example of the disposal of large numbers of medieval cattle, which may have died from epidemic disease. The
archaeologists’ response to this feature highlights the problem faced by zooarchaeologists in acquiring such evidence. Fears of relatively modern anthrax delayed investigation of the feature. Subsequently, only a section was cut through the fill, with no attempt made to recover articulated bodies.

The catastrophic mortality and pit burial of the Chillingham herd in the severe winter of 1947 is also a reminder that disease and starvation might be indistinguishable archaeologically.

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**Title:** Occipital dysplasia in dogs: the archaeological evidence

**Author(s):** Jessica M. Grimm (Wessex Archaeology, UK)

**Abstract:** The reason for exploring occipital dysplasia in archaeological dog assemblages is that two dog skulls with this condition landed on my table shortly after one another. The first skull came from a ritual shaft from a sanctuary complex near the Roman town of Springhead (published in Grimm, J.M., 2007. A dog’s life: Animal bone from a Romano-British ritual shaft at Springhead, Kent (UK), *Beiträge zur Archäozoologie und Prähistorischen Anthropologie VI*, p. 54-75). The second skull comes from Roman layers at Colchester. Both skulls display a foramen magnum in the form of an upturned key-hole, due to the fact that in occipital dysplasia there is a failure of complete ossification of the supraoccipital bone. Both dogs were quite young and might have died from complications relating to this condition.

It is probably no coincidence that both dog skulls are Roman in date. With the Romans, dwarf dog breeds start to appear in north-western Europe. Although occipital dysplasia occasionally occurs in all dog breeds, small breeds show a higher incidence of the defect. The proposed paper will explore the incidence of the condition in archaeological assemblages from north-western Europe to come to an understanding of their chronological and geographical distribution.

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**Title:** Animal health in the rural civitas Batavorum

**Author(s):** Maaike Groot (Vrije Universiteit, Amsterdam, The Netherlands)

**Abstract:** This paper focuses on the evidence for animal health in the Roman *civitas Batavorum*, which coincides with the modern eastern and central river area in the Netherlands. In the Roman period, this was an agrarian region, with small settlements of one to five farms. With several large-scale excavations and excellent preservation, this is one of the best-known regions of the Netherlands archaeologically.

My paper aims to provide an overview of the state of research of paleopathology for this region and period. It is partly based on my own research, and partly on published site reports. Some well-known problems of animal paleopathological studies are encountered: isolated fragments; problems with diagnosis; pathological lesions in unidentifiable fragments, etc. Therefore, I will focus on those types of pathology that are relatively common and relatively easy to recognise and diagnose: oral pathology; arthritis; pathology of the foot skeleton; infection; and fractures.
I will compare the occurrence of pathological changes in different species, to see whether some species were looked after better than others. This could reflect how animals were valued by people. The study of paleopathology is sometimes criticised for not being relevant enough archaeologically, so I will try to address some issues that have wider implications.

Title: Ploughing on: more adventures with pathological changes in cattle phalanges

Author(s): Matilda Holmes (School of Archaeology and Ancient History, University of Leicester, Leicester, UK)

Abstract: Recently, the pathological index developed by Bartosiewicz et al. (1997) has been used to investigate the economic use of cattle on Roman and medieval sites in England. This poster builds upon this research by attempting to identify changing plough technology in the early medieval period. There has been much discussion of when the medieval ‘heavy plough’ was introduced. This was a major technological innovation, but one that would have had a potentially profound effect on the skeletal health of cattle. Analysis of faunal remains from two Saxon sites in England affords the opportunity to investigate whether and/or when this occurred and produced data to continuously chart pathological changes in the lower limb from the Roman to the medieval period.

Title: Analysis of skeletal pathologies in modern and Viking Age horses from Norway

Author(s): Anne Karin Hufthammer (Bergen University, Bergen, Norway) and Linas Daugnora (Lithuanian Veterinary Academy, Kaunas, Lithuania)

Abstract: This study aims to identify and determine the causes of skeletal pathologies in modern (1920-1953) native Norwegian horse breeds (Fjordhest and Dølehest) and Viking Age horses from Norway. Bone pathological changes were identified in 101 of the 163 skeletons at the osteological collections held at Bergen Museum, University of Bergen.

The study shows spondylopathy on the neck, interscapular region and sacral region (degeneration of intervertebral discs, periarticular osteophytes, unilateral/bilateral asymmetry of the sacrum), diseases of joints (degenerative tarsal joint disease, joints between middle and distal phalanges, osteoarthritiis/osteoarthrosis), dental caries, fractures of ossa sternocostalia, desmoiditis ossificans ligamentum interosseum, ossification of the ligamentum transversum acetabuli and traumatic fractured legs bones (mainly fibula).

Similar pathologies have been observed on skeletons from the Viking Age Oseberg burial. Osteoarthrosis, periostitis of metapodials, spondylopathy, periarticular exostoses and digital region pathology (interphalangeal joint periarthritis and hoof periarthritis) were diagnosed. Besides the above mentioned pathologies, articulation atlanto-occipital region and pyramis otica pathology were diagnosed in skeletons from the contemporary Gokstadskipet burial mound. Causal factors for the lesions may include riding, heavy traction, carrying loads, breeding, conditions of upkeep, feeding conditions or genetics.

Title: Pathological changes in the hind limb of a horse from the Roman Period
**Author(s):** Maciej Janeczek, Aleksander Chrószcz (Department of Biostructure and Animal Physiology, Faculty of Veterinary Medicine, Wrocław University of Environmental and Life Sciences, Wrocław, Poland), Zora Miklíková (Institute of Archaeology, Slovak Academy of Sciences, Nitra, Slovakia) and Marian Fabiš (Private Veterinary Surgeon, Nitra, Slovakia)

**Abstract:** During the rescue archaeological excavation of a multicultural settlement at Nitra-Chrenová (south-western Slovakia) an assemblage of animal bone remains was revealed. In one of the settlement features dated to the Roman period a complete horse skeleton was discovered. A macroscopic and radiographic investigation was carried out in the hind limb of this animal. Exostoses on the tibia, talus and metapodia were observed. The articular surfaces were destroyed. The anatomical structures of the talus were not visible due to the new bone formation. In addition, osteomyelitis in the talus was observed. It is suggested that the pathological changes were caused by septic inflammation as a consequence of a complicated wound of the tarsal region or perforating trauma of the tarsal joint.

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**Title:** Pathological study of modern rabbit remains: a reference case to be applied to the analysis of archaeological rabbit assemblages

**Author(s):** Lluís Lloveras (Departament de Prehistòria, Història Antiga i Arqueologia, Universitat de Barcelona, Spain), Richard Thomas (School of Archaeology and Ancient History. University of Leicester, UK), Marta Moreno-García (Instituto de Historia, Centro de Ciencias Humanas y Sociales, CSIC, Spain), Jordi Nadal (Departament de Prehistòria, Història Antiga i Arqueologia, Universitat de Barcelona, Spain), Xavier Tomàs-Gimeno (Servei de radiodiagnòstic, Hospital de Sant Pau, Barcelona, Spain) and Carme Rissech (Departament de Biologia Animal, Universitat de Barcelona, Spain).

**Abstract:** Although rabbits are the most abundant taxon on many archaeological sites paleopathological studies of their remains have never been carried out. This is an important research topic that needs to be investigated. Recognition of the health status of rabbits accumulated in the archaeological record can provide data regarding their relationships with humans in the past and also about the environment they inhabited.

In this paper an assemblage of modern rabbit bones recovered from an experimental taphonomic study were analysed for pathologies. The lesions observed through macroscopic and radiological analyses are described in detail. Pathologies mostly affected the lower limb bones and primarily took two forms: diaphyseal periostosis and periarticular porosities. Differential diagnosis of the periostosis suggests that pododermatitis is the most probable cause. Diverse factors may predispose an animal to developing this condition, including a lack of movement, abrasions followed by infection, inadequate diet and poor sanitation. Detailed macro-morphological and radiological examination of the periarticular porosities strongly indicates hypervascularity of the epiphysis and metaphysis. This feature, combined with pronounced bilateral asymmetry and associated muscular skeletal markers is suggestive of a developmental anomaly that affected the conformation of these animals. It is speculated that conditions of upkeep are responsible for both conditions, since both pododermatitis and bilateral asymmetry can be caused by environmental stress during skeletal development.
Taken together these pathologies could provide meaningful information regarding the living conditions of past rabbit populations, and should be considered in future analyses of archaeological remains.

**Title:** What’s mine is yours: a histological investigation into the parasites shared between man and beast in ancient Egypt  

**Author(s):** Conni Lord (KNH Centre for Biomedical Egyptology, University of Manchester, Manchester, UK)  

**Abstract:** Scientific examination of human mummified remains from ancient Egypt has yielded much information regarding infection from a vast range of parasites. Given the rich, interdependent relationship shared between man and beast, many of these species of parasites would have been common to both.

The research that is the subject of this presentation examines human and animal coprolites from the Kellis settlement and cemetery sites in the Dakhleh Oasis, Egypt, dating to the Egyptian Roman Period (30BC – AD395). The aim is to compare the parasites found to be common in both human and animal in order to investigate both prevalence and disease transmission. These Kellis site results will be compared to those of a British site dating to a similar time period.

Histology, unusual in coprolite studies, is the chosen technique as it offers some advantages over the usual flotation/sieve methods. Firstly, only an extremely small sample is required for maximum results and secondly, sample elements are kept and viewed in context.

The close relationship between human and animal in ancient Egypt is undeniable, evidence for it exists in their art, furniture, jewellery and literature. While research into ancient Egyptian human mummies has been undertaken for the past 100 years, the corresponding research into their animal counterparts lags far behind. This imbalance needs to be addressed as no picture of the life, health, disease and death of such an agricultural society can be complete without it.

**Title:** Unhealthy and traumatic bone lesions in Bronze Age mammals from Armenia  

**Author(s):** Ninna Manaseryan (Institute of Zoology Armenian NAS, Armenia)  

**Abstract:** The paper deals with the study of unhealthy and traumatic bone formations in sub-fossil mammals collected from archaeological excavations. The material used for the study included bones gathered from ten Bronze Age sites. When sorting out the bones of sub-fossil mammals (over 15,000 specimens), unhealthy bone formations were found on deer antlers as well as on mandibles and phalanges in cattle and carnivores. Findings also include bones with knitted bone fractures, osseous calluses, and rachitic distortions, etc. It is concluded that unhealthy and traumatic bone formations in mammals were not frequent.

**Title:** Labour’s diseases in the bones of pack animals. A view from the legs of prehispanic camelid herds in Peru
Author(s): Patricia K. Maita (National Museum of Archaeology, Anthropology and History of Peru, Lima, Peru)

Abstract: Archaeological excavations in agro-pastoral settlements have recovered several camelid skeletons that show unusual pathological conditions in the bones of the leg. These conditions are related to musculoskeletal stress and injuries that could indicate the use of camelids as pack animals. This poster diagnoses the recorded pathologies and provides information about health and pastoral management of prehispanic camelid herds in the highlands of Peru.

Title: Diseased mice: implications for human health at the Inca site of Pueblo Viejo, Peru

Author(s): Patricia K. Maita (National Museum of Archaeology, Anthropology and History of Peru, Lima, Peru)

Abstract: Below the rooms of Pueblo Viejo, archaeological excavations have found several mice burrows containing individuals of different ages. A small number of mice show skeletal pathologies related to inflammatory and infectious processes, focusing on the skull, spine and limbs. This poster describes the lesions and explores multiple diagnoses, focusing on diseases that could be transmitted to human populations, especially when mice and humans lived in the same room.

Title: Disease outbreaks among cattle in medieval Europe: a survey of the written evidence and future directions

Author(s): Tim Newfield (Department of History, McGill University, Canada)

Abstract: This paper surveys the written evidence available for outbreaks of disease among cattle in medieval Europe. Following a brief overview of the primary characteristics of the evidence, the paper uses several agricultural treatises, annals, (secular) biographies, chronicles, gesta, histories, manorial records, petitions, poems and vitae to illuminate three medieval pan-European outbreaks of disease among cattle. Panzootics are identified in the late sixth century, early ninth century and early fourteenth century – at least the latter is comparable in scale and impact to the great cattle mortalities of the eighteenth and nineteenth centuries. The origins, duration, and spatial and temporal parameters of these three pestilences are discussed and what the written evidence does not reveal about their epizootiology is highlighted; after all, in order to address where interdisciplinary studies are needed it is essential to highlight the limits of the written evidence, as well as any variation in these limits over time. The paper then addresses the issue of diagnosing medieval livestock pestilences. It is argued that only via interdisciplinary teamwork can pre-laboratory outbreaks of disease among livestock be reliably or usefully diagnosed. Several questions for palaeopathologists and palaeomicrobiologists are raised in closing.

Title: Standing out from the herd? Integrating palaeopathology and identifying changing husbandry in an Iron Age landscape

Author(s): Clare Randall (School of Conservation Sciences, University of Bournemouth, Bournemouth, UK)
Abstract: The opportunity to integrate faunal information with other methods of investigation is a desirable but generally infrequent event, more so for palaeopathology. Responding to recent attempts to move beyond using pathological specimens as interesting anecdotes, study of a large animal bone assemblage from the hillfort of Cadbury Castle, Somerset, England has attempted to utilise pathological information to understand husbandry methods and strategies from the Late Bronze Age to the end of the Iron Age. The scale and condition of the assemblage and the span of time covered has enabled consideration of issues that may take us beyond broad understandings of herd structure and into examination of how livestock animals were treated and pastured. It may also inform us on attitudes to animal health and disease and the choices made in selecting animals for culling. Using prevalence of diseases that have causal links to environment, diet and utilisation, change over time can be used in combination with other information from the faunal assemblage and archaeological data to build a picture of how living animals inhabited particular landscapes.

Title: Animal palaeopathology at the Neolithic lakeside settlement of Dispilio (prefecture of Kastoria), north-western Greece

Author(s): Eleni Samartzidou (Department of History and Archaeology, Aristotle University of Thessaloniki, Greece)

Abstract: The site of Dispilio is located along the southern edge of the lake of Kastoria. The site was occupied during Middle and Late Neolithic, Bronze Age and Classical periods. The animal bones with characteristics indicative of pathologies came from the four occupational phases of the site dated to the Late Neolithic; the surface layer was, also, included in the analysis because of the considerable number of bone fragments.

Bones with indications of pathology were recorded according to general categories: oral pathology; diseases of joints; traumatic injuries; traumatic injuries/diseases of joints; traumatic injuries/infection; and exostoses of unknown origin. Oral pathology was recorded and studied in more detail, because of the complex nature of its aetiology.

Statistical evaluation of many characteristics of the sample has been conducted as well as a research for this kind of published data from other Neolithic sites in Greece. The results of the latter are interesting as far as it concerns the development and current situation of palaeopathological studies of animal remains in Greece.

Title: Healed bone fractures in dog burials from the Persian period at Tel Dor, Israel

Author(s): Lidar Sapir-Hen (Department of Zoology, Tel-Aviv University, Tel Aviv, Israel), Guy Bar-Oz (Zinman Institute of Archaeology, University of Haifa, Haifa Israel), Ilan Sharon (Institute of Archaeology, Hebrew University, Jerusalem, Israel) and Tamar Dayan (Department of Zoology, Tel-Aviv University, Tel Aviv, Israel)

Abstract: Dogs are associated with different cults and rituals in ancient Near Eastern cultures. Dog burials were widespread over the southern Levant during the Persian period, in association with the Phoenician culture.
Eight complete or partial dog (*Canis lupus familiaris*) burials were uncovered in the Persian period stratum of Tel Dor, located on the Mediterranean coast of Israel. The dogs (6 adults, 5 juveniles) were buried in what seems to have been an open area, probably in deliberately dug pits. These burials resemble the ritualistic or sacrificial phenomenon known in this period.

Healed bone fractures were evident on five individuals. Two individuals displayed an oblique and displaced fractured femur, followed by severe infection resulting in bone length reduction. Two dogs displayed a transverse rib fracture; another displayed a fractured radius.

Bone traumas were reported for Persian dog burials also at another Israeli site, Ashkelon. However, none were reported for dogs from other periods in Tel Dor or other sites.

Though these traumas were not the cause of death, they tell us of human-canine relationships in the Persian period. While the traumas may have resulted from some sort of abuse, suggesting that the dogs did not enjoy a sacred status in life, they may also reflect some care after trauma, reflecting their significance to humans. Further research is required to discern between these scenarios.

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**Title:** Pathological changes on cattle calcaneus from Viking Age settlements in Sweden

**Author(s):** Ylva Telldahl (Department of Archaeology and Classical Studies, Stockholm University, Sweden)

**Abstract:** The animal bones from archaeological sites are no longer only the subject for studies concerning food distribution. During the last decade, for example, an interest has developed concerning draught animal power, since intensification in agricultural practices led to the increased utilisation of draught animals. Both cows and bulls/oxen were most probably used for different purposes and most of them were kept to produce meat and/or milk. The breeding strategies probably affected the degree to which these were used to pull wagons during the cultivation season.

Recently, research has focused attention on the identification and classification of skeletal lesions associated with specific animal uses. As a result, new methods have been developed for grading pathologies. Studies have, for example, been carried out on metapodials and phalanges as these bones are affected when repeated stress is set upon them. This research focuses instead on the development of exostoses along the sulcus for *Musculi flexor hallucis longi* on the cattle calcaneum and at the same time evaluates the possibilities of sexing the bone using different measurements and methods. Both metapodials and phalanges ossify before the *Tuberositas Calcaneus*; thus the calcaneum is still growing if the animal is put to work before three years of age. This would therefore probably affect the bone structure or its capacity of withstanding forces compared to fully-grown bones. Interpretations of the calcaneum are often hampered by the failure to determine sex reliably, even though it is one of the most common cattle elements recovered in archaeological assemblages.

This study is part of a larger research project on the utilisation of draught animals at Fröjel harbour on the island of Gotland and the fortification Eketorp on the island of Öland, Sweden. Key questions discussed are whether size differences are homogenous over time.
when sexing the calcaneum and if bone size is correlated with the development of pathologies along the sulcus for Musculi flexor hallucis longi.

Title: Rabbiting on about disease: pathologies in a population of Oryctolagus cuniculus from a British archaeological site

Author(s): Richard Thomas (School of Archaeology and Ancient History, University of Leicester, Leicester, UK) and Lluís Lloveras (Departament de Prehistòria, Història Antiga i Arqueologia, Universitat de Barcelona, Spain)

Abstract: Successful palaeopathological analyses often rely on the identification of temporal and/or spatial patterns of lesion prevalence. For this reason, it is imperative that the nature and prevalence of pathologies in known-history populations is established to separate what is ‘pathological’ from what is ‘non-pathological’ and to determine the factors influencing lesion formation. Studies of the nature and prevalence of lesions in modern comparative animal populations forms an essential component of this research. However, modern comparative collections do not exist for many species and some lesions are not observed in modern animal populations. Consequently, consistent analysis of lesion prevalence in large samples of animal bones from archaeological sites is often the only way in which epidemiological information can be collected. In recognition of this fact, this paper presents the palaeopathological analysis of a non-anthropogenic archaeological accumulation of rabbit bones from the site of Dudley Castle, West Midlands.

Title: On the origins of disease: evolution and impact of animal diseases

Author(s): Elizabeth Uhl (Department of Pathology, University of Georgia, USA)

Abstract: For historical reasons, mostly related to when medical education was standardized, veterinary medicine and pathology have been predominately focused on the proximate mechanisms of disease. Proximate explanations describe the immediate anatomic and physiological features of disease processes. While this approach has provided great advances in understanding the mechanisms of disease, it has generally not provided answers to the questions of why disease exists. Darwinian medicine, which was only formalized in the early 1990s, is a discipline that uses evolutionary perspectives to explain why vulnerabilities to diseases exist and why they differ between species. An evolutionary perspective has much to offer the study of animal diseases, both past and present, as it can explain and potentially predict why epidemics occur and why specific diseases are or were common. For example, mismatches between the environment an animal is genetically evolved to live in and its actual, often manmade, environment can often explain disease vulnerabilities and incidences. In addition, selective breeding for traits that are not always adaptive have contributed to disease vulnerability in domestic animals, especially dogs. Indeed, the prevalence and type of bone diseases in dogs can best be predicted based upon size and age. The evolutionary perspective not only provides an explanation of the disease patterns and lesions occurring in animals, it has the potential to predict what types of diseases were common in the past. Such predictions could provide a useful context for lesions identified in ancient animal remains.
**Title:** Abnormalities of post-medieval sheep metapodia  
**Author(s):** Stephanie Vann (Freelance Consultant, Leicester, UK)  
**Abstract:** This paper examines abnormalities of sheep (*Ovis aries*) metapodia from the late 18th – 19th centuries AD site of Tumbling Fields, Tiverton, Devon. In particular, two different conditions are discussed: small, oval cavities in the proximal articulation of the metacarpals, and a ridge of bone on the proximal anterior shaft of the metatarsals. Comparisons are presented from other medieval and post-medieval sites, and potential aetiologies are considered.

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**Title:** Osteochondrosis in cattle: an initial study  
**Author(s):** Richard Ward and Jacqui Mulville (Department of Archaeology, University of Cardiff, Cardiff, UK)  
**Abstract:** Osteochondrosis, often referred to as osteochondritis or Baker & Brothwell Type 1 lesions, occurs on the articular surfaces of elements and are visible as longitudinal or triangular shaped disturbances of the articular surface, often described as pits. These lesions are frequently present within modern livestock often on the bones of the hock joint, but are predominate on the first phalanx. The lesions are frequently noted within archaeological remains as the final stages of the lesions are easily noted during the recording. Despite the prevalence of these lesions, there has only been limited research into the disorder.

This paper presents initial research into the incidence and characteristic of osteochondrosis within cattle remains recovered from sites dating from the Bronze Age to the Norse period on South Uist, Western Isles, Scotland. The occurrence and location of all lesions within these assemblages was noted and the structure and form of a sample of the lesions examined in detail using Scanning Electron Microscopy. The overview of the entire cattle assemblage has mapped the incidence of the disorder throughout the skeleton and provided detail on its relationship (if any) to other pathologies present, whether it was a prolific disorder, and any change in its incidence over time. The detailed SEM study has provided a better understanding of how and why this disorder develops within cattle.

From this study it is now possible to consider this disorder in a new light. Through the amalgamation of this information with other zooarchaeological and archaeological information a more holistic understanding of the use the use of cattle and their treatment on this site has been reached. The paper highlight the potential for detailed study of other assemblages using these techniques and considers the value of this research in provided a fuller account of cattle husbandry in past societies.

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**Title:** Man and beast: a deadly combination? The application of skeletal lesion patterning and differential diagnosis to the study of a zoonotic disease  
**Author(s):** Jeanette Wooding (Division of Archaeological, Geographical and Environmental Sciences (AGES), University of Bradford, Bradford, UK)  
**Abstract:** Palaeopathology in human osteoarchaeology has developed considerably in the last three decades. Successful alliances have been forged between medical practitioners, archaeologists and anthropologists, resulting in both a structured and standardised
framework of practice. Unfortunately, the field of archaeozoology has not shared the same fate; progress has been comparatively slow, impeded by the disarticulated nature of faunal assemblages and the lack of standard recording methods for palaeopathological conditions in animal remains. As a consequence, researchers can draw little confidence that routine recording of palaeopathological lesions, their description or their differential diagnosis will ever form a standard part of archaeozoological analysis under present circumstances. This research seeks to tackle these obstacles by bringing the disciplines of archaeozoology and human osteoarchaeology to bear on the study of bovine tuberculosis (bTB) – a zoonotic disease known to affect both animals and humans.

Although bTB is a significant health problem in modern wild and domesticated animals, information (both written and pictorial) related to its skeletal manifestation in faunal remains is scarce, although informative where it exists. This research aims to provide a better understanding of this disease among animals in the past through the implementation of skeletal lesion patterning and differential diagnosis; methods regularly employed in human palaeopathology. Modern and archaeological articulated animal bone groups (ABG’s) and disarticulated archaeological assemblages have been targeted for study, with radiography and ancient DNA analyses also utilised.

Title: Using palaeopathological evidence to interpret animal bone deposits: a cattle hide from Groundwell Roman Villa, Swindon

Author(s): Fay Worley and Simon Mays (English Heritage, Fort Cumberland, Portsmouth, UK)

Abstract: A deposit of young cattle bones from Groundwell Roman Villa are interpreted as representing a single individual, although the bones had not been recognised as an associated group during excavation. This interpretation is based on the nature and distribution of pathological lesions, together with age-at-death and butchery mark evidence. This poster examines pathological lesions on the tarsals, metatarsal and phalanges, suggesting alternate diagnoses for the condition. It goes on to propose that the element representation and butchery evidence indicate that the deposit was probably tanning waste.

The Hecabe congress centre, Katerini (photograph taken by Theo Antikas)