



Hard Tissue and Bioarchaeology Research Group (HTBRG)

Members

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The HTBRG at the University of Hildesheim is undertaking research on mineralized dental and skeletal tissues of vertebrates, with a focus on humans and other mammals. In doing so, we attempt to contribute to a variety of topics including the development and structure-function relationships of mineralized tissues, the evolution and functional morphology of dental and skeletal structures, the reconstruction of living conditions of past human and animal populations, and the effects of pollutants and environmental perturbations on individuals and populations. Members of the group have a wide range in expertise in different fields, including biological anthropology, zoology, ecotoxicology, palaeoecology and palaeopathology as well as the preparation and analysis of skeletal and dental tissues. Methods used in these studies include different macroscopic, microscopic (analysis of thin sections in ordinary and polarized light, fluorescence microscopy, scanning electron microscopy) and radiographic (standard x-ray imaging, computed tomography) techniques, hardness testing, elemental analysis (including microprobing), and isotope analysis. Our work typically combines fieldwork and laboratory research and is mainly performed as part of several international research projects. Presently our research is mainly focused on the following topics:

- Microstructural correlates of growth rhythms in enamel and dentin of different mammalian species and reconstruction of patterns of tooth crown growth based on these incremental markings
- Enamel hypoplasia and structural abnormalities in enamel and dentin as records of growth perturbations caused by systemic stress events and the use of these markers for life history reconstruction
- Effects of excess fluoride on enamel and dentin formation and the use of dental fluorosis as a biomarker of excess fluoride exposure in free-ranging mammals

- Studies on human skeletal assemblages from different geographical and temporal contexts including palaeopathological and palaeoepidemiological investigations as a means of reconstructing living conditions of past populations. Currently human archaeological remains from the Upper Paleolithic of Central Europe, the Bronze age of Syria and Germany, and early medieval sites in Germany are under investigation
- The structure and development of deer antlers, which constitute the fastest growing bony structures in vertebrates and the only bony organs in mammals that are capable of full regeneration

A selection of recent papers by members of the HTBRG at the University of Hildesheim

- Flohr, S.; Brinker, U.; Spanagel, E.; Schramm, A.; Orschiedt, J.; Kierdorf, U. (in press) Killed in action? A biometrical analysis of femora of supposed battle victims from the Middle Bronze Age site of Weltzin 20, Germany. In: Martin, D.L.; Anderson, C.P. (eds.) *Bioarchaeological and forensic perspectives on violence: how violent death is interpreted from skeletal remains*. Cambridge University Press, New York.
- Kierdorf, H.; Kierdorf, U.; Frölich, K.; Witzel, C. (in press) Lines of evidence – the nature of incremental markings in molar enamel of Soay sheep as revealed by a fluorochrome labeling and backscattered electron imaging study. *PLOS ONE*.
- Kierdorf, U.; Flohr, S.; Gomez, S., Landete-Castillejos, T.; Kierdorf, H. (in press) The structure of pedicle and hard antler bone in the European roe deer (*Capreolus capreolus*): a light microscope and backscattered electron imaging study. *Journal of Anatomy*.
- Gomez, S.; Garcia, A.J.; Luna, S.; Kierdorf, U.; Kierdorf, H., Gallego, L.; Landete-Castillejos, T. (2013) Labeling studies on cortical bone formation in the antlers of red deer (*Cervus elaphus*). *Bone* **52**, 506-515.
- Kierdorf, U, Kierdorf, H., Konjević, D. (2013) Pathological fracture of a red deer antler secondary to purulent inflammation – a case report. *Veterinarski Arhiv* **83**, 347-356.
- Kierdorf, H.; Hommelsheim, S.; Kierdorf, U. (2012) Development of the permanent mandibular cheek teeth in fallow deer (*Dama dama*). *Anatomia Histologia Embryologia* **41**, 419-427.
- Kierdorf, H.; Witzel, C.; Upex, B.; Dobney, K.; Kierdorf, U. (2012) Enamel hypoplasia in molars of sheep and goats, and its relationship to the pattern of tooth crown growth. *Journal of Anatomy* **220**, 484-495.
- Kierdorf, U.; Bahelková, P.; Sedláček, F.; Kierdorf, H. (2012) Pronounced reduction of fluoride exposure in free-ranging deer in North Bohemia (Czech Republic) as indicated by the biomarkers skeletal fluoride content and dental fluorosis. *Science of the Total Environment* **414**, 686-695.
- Kierdorf, U.; Kahlke, R.-D.; Flohr, S. (2012) Healed fracture of the tibia in a bison (*Bison menneri* Sher, 1997) from the late Early Pleistocene site of Untermassfeld (Thuringia, Germany). *International Journal of Paleopathology* **2**, 19-24.
- Kierdorf, U.; Kierdorf, H. (2012) Antler regrowth as a form of epimorphic regeneration in vertebrates – a comparative view. *Frontiers in Bioscience* **E4**, 1606-1624.
- Flohr, S.; Witzel, C. (2011). *Hyperostosis frontalis interna* – a marker of social status? Evidence from the Bronze-age “high society” of Qatna, Syria. *Homo* **62**, 20-43.
- Kierdorf, U. (2011) How many mandibles in a mammal? A note on terminology. *Anatomia Histologia Embryologia* **40**, 107-111.
- Kierdorf, U.; Kierdorf, H. (2011) Deer antlers – A model of mammalian appendage regeneration: an extensive review. *Gerontology* **57**, 53-65.

- Maggiano, I.S.; Maggiano, C.M.; Tiesler, V.; Kierdorf, H.; Stout, S.D.; Schultz, M. (2011) A distinct region of microarchitectural variation in femoral compact bone: histomorphology of the endosteal lamellar pocket. *International Journal of Osteoarchaeology* **21**, 743-750.
- Richter, H.; Kierdorf, U.; Richards, A.; Melcher, F.; Kierdorf, H. (2011) Fluoride concentration in dentin as a biomarker of fluoride intake in European roe deer (*Capreolus capreolus*) – an electron-microprobe study. *Archives of Oral Biology* **56**, 785-792.
- Flohr, S.; Leckelt, J.; Kierdorf, U.; Kierdorf, H. (2010) How reproducibly can human ear ossicles be measured? A study of interobserver error. *Anatomical Record* **293**, 2094-2106.
- Richter, H.; Kierdorf, U.; Richards, A.; Kierdorf, H. (2010) Dentin abnormalities in cheek teeth of wild red deer and roe deer from a fluoride-polluted area in Central Europe. *Annals of Anatomy* **192**, 86-95.
- Richter, H.; Kierdorf, H.; Kierdorf, U.; Clemen, G.; Greven, H. (2010) A microscopic and microanalytical study (Fe, Ca) of the teeth of the larval and juvenile axolotl (*Ambystoma mexicanum*, Urodela). *Vertebrate Zoology* **60**, 27-35.
- Flohr, S.; Kierdorf, U.; Schultz, M. (2009) Differential diagnosis of mastoid hypocellularity in human skeletal remains. *American Journal of Physical Anthropology* **140**, 442-453.
- Kierdorf, H.; Kierdorf, U.; Witzel, C.; Intoh, M.; Dobney, K. (2009) Developmental defects and postmortem changes in archaeological pig teeth from Fais Island, Micronesia. *Journal of Archaeological Science* **36**, 1637-1646.
- Kierdorf, U.; Li, C.; Price, J.S. (2009) Improbable appendages: deer antler renewal as a unique case of mammalian regeneration. *Seminars in Cell and Developmental Biology* **20**, 535-542.
- Lazar, P.; Konjević, D.; Kierdorf, U.; Njemirovskij, V.; Čurlík, J.; Grubešić, M. (2009) Traumatic injury to the incisive bones and maxillary dentition in a male gray wolf (*Canis lupus L.*) from Slovakia. *European Journal of Wildlife Research* **55**, 85-89.
- Pokorny, B.; Jelenko, I.; Kierdorf, U.; Kierdorf, H. (2009) Roe deer antlers as historical bioindicators of lead pollution in the vicinity of a lead smelter, Slovenia. *Water, Air, and Soil Pollution* **203**, 317-324.
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- Maggiano, I.S.; Schultz, M.; Kierdorf, H.; Sierra Sosa, T.; Maggiano, C.M.; Tiesler Blos, V. (2008) Cross-sectional analysis of long bones, occupational activities and long-distance trade of the classical Maya from Xcambó – archaeological and osteological evidence. *American Journal of Physical Anthropology* **136**, 470-477.
- Rolf, H.J.; Kierdorf, U.; Kierdorf, H.; Schulz, J.; Seymour, N.; Schliephake, H.; Napp, J.; Niebert, S.; Wölfel, H.; Wiese, K.G. (2008) Localization and characterization of Stro-1⁺ cells in the deer pedicle and regenerating antler. *PLOS ONE* **3(4)**: e2064.
- Witzel, C.; Kierdorf, U.; Schultz, M.; Kierdorf, H. (2008) Insights from the inside: histological analysis of abnormal enamel microstructure associated with hypoplastic enamel defects in human teeth. *American Journal of Physical Anthropology* **136**, 400-414.