

ABSTRACTS

with the number of allomaternal caregivers (MSD: N=7, SD=14.65, $r=0.32$; Bayley-III: N=5, SD=3.65, $r=0.33$). Conversely, for infants aged 16-18 months, these scores decrease with the number of allomaternal caregivers (MSD: N=10, SD=10.41, $r=-0.51$; Bayley-III: N=3, SD=1.15, $r=-0.90$). These conflicting results are likely a product of small sample size, as the variation in scores between included infants age 16-18 months was quite small. Alternatively, these results may suggest that AMC does not uniformly impact cognition, suggesting AMC may be more critical during earlier developmental stages rather than later ones. Future analyses across the entire study population (expected N=100) may clarify these results.

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The impact of tetracycline presence on endogenous DNA yield in the Kulubnarti Nubians

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Ancient DNA (aDNA) is providing new insights into the genetic composition of and relationship between the two socially-distinct Nubian populations of Early Christian Period Kulubnarti (550-800 C.E.). Currently, aDNA analysis requires the amplification of small amounts of endogenous DNA using the Polymerase Chain Reaction, or PCR. Like skeletal remains from other Nubian and select Egyptian sites, most of the remains from Kulubnarti contain tetracycline, an antibiotic secreted by *Streptomyces* bacteria that are highly prevalent in Sudanese Nubian soils. Tetracycline was produced during the fermentation of grains and was most likely ingested by the Nubians and Egyptians through consumption of beer. As a protein-synthesis inhibitor, tetracycline reduces the efficacy of PCR amplification and decreases sequencing yields when extracted alongside DNA using phenol/chloroform extraction methods. However, the correlation between tetracycline presence and endogenous aDNA yield has not previously been explored when silica-based DNA extraction protocols are used.

To determine whether the presence of tetracycline in skeletal remains impacts endogenous DNA yield when silica-based extraction protocols are used, we compare the percentage of tetracycline-labeled bone area in rib and clavicle cross-sections with the percentage of endogenous DNA recovered from petrous bone for 30 individuals from Kulubnarti. In contrast to studies that use phenol/chloroform extraction methods, our results suggest that the amount

of tetracycline-labeled bone is not correlated with endogenous DNA yield when silica-based DNA extraction methods are used ($R^2 = 0.014$, $p = 0.94$). We therefore recommend that any aDNA studies analyzing skeletal material containing tetracycline-labeled bone employ silica-based methods for DNA extraction.

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The potential of the Georgie Project (Portuguese Water Dog) for discerning genetic from extra-genetic influences in structural and material variations in anthropoid limb bones

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In human humeri, radii, second/ third metacarpals, femora, and tibiae, Jepsen and Schlecht found significant covariance between external size, volume, mineralization and stiffness that is not well explained by sexual /physical characteristics suggesting genetic > environmental factor influences. Genetic bases for these relationships have been examined in mice; genotype-specific differences account for variability in adult traits (cortical area, polar moment of inertia, and tissue mineral density). Because mice data do not mirror human between-sex differences, we commenced studying femora from the Georgie Project (<http://www.georgieproject.com>; Portuguese Water Dogs). At our institution DNA from over 1000 dogs has been studied for associations between quantitative trait loci and morphological variations. 30 femora were randomly picked (all: 6-17 years old, mean: 12.6). Measurements: cervico-diaphyseal angle, total bone and biomechanical lengths, head diameter, femoral-head offset length, diaphyseal sagittal bow, and proximal femoral anteversion. Transverse cross sections were analyzed for cortical area, total area, and second moments of area. Mineral content (%ash) was determined at 50% section quadrants. Mineralization and robustness variations are greater than expected, with cortical robustness (cortical area divided by total area) negatively correlated with age ($r=-0.547$, $p=0.002$). In females, cortical robustness and age were also negatively correlated ($r=-0.545$, $p=0.024$); correlations in males trended the same. Average ash correlated significantly/positively with cortical robustness with suggestion of male/female differences. Large variations in our data is promising for study of the entire cohort and has clear potential for translation to anthropoid limb bones, including study of genetic linkages of bone microstructural characteristics.

Below the crown: examining interspecies variation in postcanine enamel thickness, EDJ, and root form in the *Paranthropus* clade

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Although there is considerable evidence of shared craniodental morphology within the *Paranthropus* clade, microwear and isotopic studies suggest that this shared morphology may be linked to different dietary behaviour in eastern and southern Africa. Recently, it has been demonstrated that detailed morphological analyses of the internal structure of tooth crowns (specifically, enamel thickness, enamel-dentine junction morphology and root/pulp canal form), assessed using high resolution microtomography, can reveal previously undetected differences in tooth structure that can have systematic and functional implications.

In this study, we generate high-resolution surface models of the EDJ surface, external root surface, and pulp canal form of *Paranthropus* specimens from Kromdraai, Swartkrans, Drimolen, Koobi Fora, West Turkana, and the Omo. We assess enamel thickness in 2D mesial planes of section, root/canal form through an expanded qualitative typology for the hominin clade, and EDJ morphology through landmark-based 3D geometric morphometrics.

Our results indicate that 1) the generally accepted derived nature of *P. boisei* relative to *P. robustus* is matched by detailed morphological features of the crown (increased enamel thickness and very low dentine horns) and roots (increased root volumes and increasing distal pulp canal size); 2) there is evidence for population differences between sites preserving *P. robustus*; and 3) there is evidence at Gondolin (South Africa) for morphological similarity in molar form with *P. boisei* from Koobi Fora. The implications of these findings for the systematics, functional morphology, and paleogeography of *Paranthropus* are discussed.