Fund, Richard Leakey and Wildlife Direct, Stony Brook University.

Analysis of cell-specific regulatory DNA reveals elevated immune specificity in genomic regions of high Neandertal ancestry

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Following King and Wilson, many studies have suggested the importance of regulatory evolution in driving adaptive divergence between species. This observation makes regulatory regions prime candidates for adaptive introgression between closely related populations. This is particularly true in the adaptive immune system, where genetic variation is essential to adaptive responses to pathogen diversity. Neandertals, a population of archaic humans that lived in Europe and Central Asia between ~200 and 30 thousand years ago make up at least 1.5% of the ancestry of modern humans with recent ancestry outside of sub-Saharan Africa. We tested the hypothesis that Neandertal introgression contributed disproportionately to the immune systems of modern humans. To that end, we analyzed regulatory specificity in a set of DNase I hypersensitive sites, a genomic approach to characterize regulatory DNA, from karyotype normal immune- and non-immune cells from the ENCODE project. We find that DHS with higher amounts of Neandertal ancestry in the 1000 genomes project are enriched with regulatory regions that are highly specific to active T-cells. We further characterize these results in the context of natural selection by utilizing information about the haplotype structure around T-cell specific regulatory sites, information content of Neandertal-derived alleles in binding motifs, and gene-expression data.

This research was funded by the Cornell Center for Comparative and Population Genomics (3CPG).

Cathemerality and sleep intensity in seven captive lemur species

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Most primates spend about one-third of their lives asleep, yet we know remarkably little about the factors that drive this variability. Of particular importance in this regard is sleep intensity (SI), which is hypothesized to vary among primates and to be an important factor in human sleep. SI encompasses two variables that are behavioral proxies for slow wave sleep: *sleep fragmentation* (the number of brief awakenings greater than 2 minutes per hour) and *sleep arousability* (number of motor activity bouts per hour). Here, we report on data generated from 99 individual lemurs representing seven species at the Duke Lemur Center. We test the hypothesis that sleep intensity will be lower in cathemeral compared to diurnal species. Using actigraphic collars (CamNtech, Motionwatch 8), we recorded a cumulative activity score over each minute for the duration of each subject's session (12 h blocks between 18:00-06:00; mean = 7 nights; total subject nights = 691). We found that lemurs are characterized by variable SI values, and that cathemerals exhibit greater arousability (n = 77, mean = 22.2, SD = 0.7 vs. n = 22, mean = 18.1, SD = 5.9, P = 0.009) but not fragmentation (n = 77, mean = 2.7, SD = 0.6 vs. n = 22, mean = 3.01, SD = 1.1, P = 0.25) when compared to diurnals. These data suggest that cathemeral lemurs may be the lightest sleepers of all the primates, yet their sleep architecture is likely similar to diurnal primates.

Funding was provided by: Duke University

Longitudinal dynamics of urinary C-peptide during early peri-menopause in Toba women: A preliminary analysis

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During the 4-5 years preceding menopause, women may experience significant changes in glucose metabolism associated with variation in ovarian hormonal levels. This preliminary study assesses the longitudinal dynamics of insulin levels (measured via urinary C-peptide) during early peri-menopause and its association with anthropometric measures and estrogen conjugates (E_1C) levels. Urine samples were collected from healthy Toba women (n = 6) living in northern Argentina. Each woman contributed an average of 83 urine samples collected 2-4 days apart, three times per year over a span of 2 years. All participants were still menstruating at the time of collection, had never used oral contraception, and were, on average, 42.4 ± 1.9 years old. Overall, C-peptide levels were relatively similar among participants, and tended to be concentrated on lower values (mean 113.0 ± 110.9 ng/mg Creat, median 68.0 ng/mg Creat). Linear regression analyses indicate variation across individuals in dynamics of C-peptide levels over time, as women either demonstrated decreasing or stable urinary levels. There was no significant association between average C-peptide levels and height or body mass index. However, E_1C and C-peptide levels were positively correlated for 4 out of the six women. There were no seasonal differences in C-peptide levels (winter: 115.4 ± 110.4 vs summer: 116.5 ± 127.5 ng/mg Creat). Metabolic dynamics and their health effects across menopause are particularly relevant to Toba women because of emerging health concerns for this population related to their recent transition from foraging to a diet characterized by high-calorie processed foods.

Funding provided by Yale University Department of Anthropology, Yale Institute for Biospheric Studies Program in Reproductive Ecology, NSF Career Award (BCS-0952264), and NIA P30 Demography of Aging (AG 012836-15) Pilot Award.

Paleoepidemiological approaches to treponemal disease

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Debate over the origin and antiquity of syphilis and the other treponematoses has acted as one of the primary stimuli for research in paleopathology for over a century. Most scholarship on archaeological cases of treponemal disease, however, has been in the form of case studies; paleopathology has only been able to meaningfully address major questions about the evolution of disease by moving away from case studies towards population-based analyses. Therefore, here we orient away from this historical focus on case studies towards epidemiological analysis of aggregate skeletal samples over multiple regions and time periods. Reported cases of individuals manifesting evidence of treponemal disease (N=>17,986) from the pre- and post-Columbian New and Old Worlds derived from gray and published literature were evaluated against established, standardized criteria for dating and the diagnosis of treponemal disease in order to generate novel insights into the natural history, ecology, manifestations, and evolution of treponemal disease. Preliminary results from analysis of a subset of the data suggests higher frequencies of skeletal involvement in treponemal disease than are suggested by estimates of skeletal involvement reported in clinical and epidemiological literature. We discuss the possible explanations for these findings, including the role of publication bias and sample sizes, as well as their potential implications for paleoepidemiological approaches to treponemal disease for paleopathological and bioarchaeological scholarship on the treponematoses.

The effect of reproductive state on female-female associations in chimpanzees (*Pan troglodytes*) at Taï National Park, Côte d'Ivoire

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Chimpanzee (*Pan troglodytes)* communities are characterized by a fission-fusion social structure where party size and composition are influenced by sex, reproductive state, age, rank, relatedness, and access to food. At Taï National Park, female chimpanzees are highly social and maintain preferred associations for years. However, female sociality and gregariousness are expected to vary according to reproductive state. Previous studies show that estrous females spend more time with males in larger groups, compared to anestrous females. However, little is known of changes in female-female social relationships across the cycle. This study examines whether and how female–female associations change across reproductive states. Focal behavioral data were collected on female chimpanzees (n=14) at Taï between 1998-2001. Females were observed monthly in each reproductive state, which was classified based on sexual swelling size using a scale from 0 (detumescent) to 4 (maximal tumescence). Female social preferences were based on party association scans, which were taken every 10 minutes. Preferred associations and group dynamics were analyzed in SocProg and UCInet. Dyadic association rates were compared for individual females (n=9) across reproductive states. Preliminary results indicate that females have different association patterns in and out of estrous. When at least one female is in estrous, parties have a higher association index and there is an increase in female-female associations. Determining how female association patterns change across reproductive state is important for understanding female sociality and the costs of reproduction.

Max Planck Institute for Evolutionary Anthropology, NSF, UIUC Research Board.

The evidence of medicinal plant use in prehistoric humans from an archaeological site in Northeastern Brazil

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This work seeks to assist in understanding the habits, cultures, preferences and strategies that were used by prehistoric groups through the identification of food remains found in the diet, the analysis of environmental conditions and identifying consumed plants, to understand the paleopharmacopeia.The coprolites and sediment samples of individuals buried at Furna do Estrago provided the necessary conditions for this type of work. The results were integrated in order to allow verification if the group were doing some kind of treatment for helminths due to the symptoms they probably felt at the time. Data on the lifestyle and habits of prehistoric populations in the Northeast are still sparse. Thus, the study of prehistoric groups offers the opportunity to deepen understanding of human adaptation and settlement in the region. The results of these analyses contribute to studies on paleoenvironment, paleonutrition and paleoparasitology, since food items were found composing a diet rich in vegetables, and pollen grains with medicinal properties were found in samples that were positive for parasitological examination. In addition it was possible to demonstrate the differences in eating habits between men and women of the prehistoric group that inhabited the archaeological site, showing an increased occurrence of starchy foods in the male diet.

capes

Lateralization and Performance Asymmetries in the Termite Fishing of Wild Chimpanzees in the Goualougo Triangle, Republic of Congo

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The nearly universal right hand preference manifested by human populations is one of the most pronounced manifestations of population-level lateralization. Morphological and archeological evidence indicate that this behavioral specialization may have emerged among our hominin ancestors. Whether population-level behavioral asymmetries are evident in non-human animals remains a topic of considerable scientific debate, with the most consistent evidence of population-level trends emerging from studies of chimpanzees (*Pan troglodytes*). However, previous studies of population-level lateralization in wild apes have relied upon data sets pooled across populations to reach adequate sample sizes. Our aim was to test for population-level handedness within a single wild chimpanzee population, and also to determine if performance asymmetries were associated with handedness. To address these questions, we coded handedness and duration of fishing probe insertions from remote video footage of chimpanzee visitation to termite nests (totaling 119 hours) in the Goualougo Triangle, Republic of Congo. Similar to reports from other populations, chimpanzees in the Goualougo Triangle showed robust individual hand preferences for termite fishing. There were 46 right-handed, 39 left-handed and 4 ambiguously-handed individuals. Though we did not detect an overall significant population-level handedness ($t(88)=0.83$, n.s.) in this study, males showed a greater right hand preference than females. Further, we found that average dipping latencies were significantly faster for right- compared to left-handed chimpanzees. Possible explanations and evolutionary implications of taxa- and task-specific patterns of population-level laterality are discussed.

Dental health in a wild population of ring-tailed lemurs (*Lemur catta*) at the Bezà Mahafaly Special Reserve and Tsimanampesotse National Park, Madagascar

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We present patterns of dental pathology within the context of feeding behavior, habitat variation and anthropogenic effects on wild ring-tailed lemur populations living in disparate habitats, the Bezà Mahafaly Special Reserve (BMSR) (2004 – 2010), which has both intact gallery forest and anthropogenically altered areas that include human croplands and degraded forest, and Tsimanompesotse National Park (TNP) (2006) which contains intact spiny thicket. These lemurs demonstrated a variety of dental pathologies including a high incidence of toothcomb plaque, heavy canine calculus with gingivitis and, more rarely, cavities. A cyclone in 2006 that toppled trees and reduced food resources at BMSR were accompanied by a much higher incidence of dental pathologies than other years ((X^2 (DF = 84, N= 127) = 118.37, $p < .008$). In addition, females had a higher percentage of pathologies that year compared to males ((X^2 (DF = 1, N = 72) = 4.68, $p < .03$). Behavioral variation such as crop-raiding also affected patterns of pathology, with crop-raiding troops exhibiting higher percentages of pathologies ((X^2 (DF = 1, N= 370) = 12.10, $p < .0007$). Different habitats were associated with different pathologies, with caries, molar staining and heavy canine calculus characterizing TNP lemurs, and toothcomb plaque, heavy canine calculus plus gingivitis more prevalent at BMSR. Comparing these results with sub-fossil lemur specimens indicates similar pathologies existed for extinct taxa. Thus, studies of living populations can also be useful in providing ecological context for understanding fossil primate dental health.

Funding: NSF BCS 0922465, University of North Dakota, University of Colorado-Boulder.

Selection gradients and ecogeographic variance in the human post-crania

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Recent work by Roseman and Auerbach (*in press*) indicates that the ecogeographic distribution of human body proportions is driven