Evolutionary perspectives of bony labyrinths in humans, chimpanzees and baboons: high resolution three-dimensional comparisons.

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The bony labyrinth consists of three parts (the two vestibular sacs, the three semicircular canals and the cochlea) and houses two functional systems. The vestibular system provides one way of motion detection in a three-dimensional space. The cochlea is specialized for sound detection. The close anatomical relationship between the bony labyrinth and the corresponding receptor endorgans provides an opportunity to study osteological specimens (including fossils).
The investigation of the three-dimensional (3D) anatomical variation of the bony labyrinth in extant species represents a prerequisite for the interpretation of their fossil closest relatives. This prerequisite has not been completely fulfilled yet due to (i) the 3D geometry complexity of the labyrinth ; (ii) the difficulty to acquire high resolution data ; (iii) the few proposed expert-independent comparative methods.
Here, we use 3D geometrical models of 40 bony labyrinths reconstructed from micro-CT scans of extant humans, chimpanzees, bonobos and baboons. We use recently developed automated computational tools allowing to process 3D free-form surfaces, and more specifically to assess the mean anatomy within a sample, the pattern of variability around this mean, and to compare samples.
Our results allow us to identify the most common features and most striking differences within and between species. The use of such automated, 3D and objective techniques, coupled with standard linear, surface or volume measurements, may allow to gain further insight into the co-evolution of the two functional systems housed in the inner ear of the extant and extinct higher primates.
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Genetic diversity of Native Americans in the multilingual area of Vaupés-Guaviare, Colombian Amazon.

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Amazon region in Colombia harbor a lot of different ethnic groups, some of these belonging to East Tucano and Guahibo language families. With the goal to estimate biological diversity in this multilingual area, we sequenced 546 pb of the mtDNA control region, typing 5 Y-STR and the Q-M3 SNP of two Tucano groups (Vaupés and Guaviare n=66) and one Guahibo group (Guaviare n=23). Tucanos of Vaupés presented 40 polymorphic sites (according to rCRS) and 29 haplotypes, Tucanos of Guaviare 34 and 19 haplotypes and Guahibos of Guaviare 15 polymorphic sities in 4 haplotypes, all belonging to the major Native American haplogroups A-D. The Guahibos mtDNA haplotype diversity is low, which is typical of Hunter – Gatherer groups, likely representing a drastic reduction of population size and the latter fixation of the present haplotypes. The Tucano scenario is different, represented by bigger gene diversity (average 0,900) and higher number of haplotypes. All Y Chromosomes belong to Q-M3 lineage; Tucanos do not share Y-STR haplotypes with Guahibos. The data show that Tucanos and Guahibos are two different groups, the Tucanos exogamous practices respect to the language, probably generate a more biological and linguistic diverse populations in the Vaupés area, Southeast of Colombia. We are reporting DNA data of two linguistic families that improve our knowledge about the biological diversity of Amazon ethnic groups.
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Aquatic resources use by Pleistocene hominins in the Turkana Basin.

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The incorporation of animal tissue into the diet of early Pleistocene hominins is often considered to be a key attribute that distinguished the later members of our genus from earlier ancestors. The expansion of the brain during this time is likely linked to a suite of other adaptations such as reduction in tooth and gut size. Current evidence of animal tissue acquisition by hominins is somewhat lacking compared to the abundant evidence for tool manufacture found throughout East Africa. This dearth of evidence has sometimes been associated with the increased risks associated with a carnivorous diet (i.e. competition with large mammalian carnivores). Here we present evidence from archaeological assemblages from the Koobi Fora Formation (Turkana Basin) that supports the hypothesis that an array of aquatic resources was part of a dietary adaptation for Pleistocene hominins. In particular, we review the evidence from high density sites where the archaeological data suggest hominins incorporated a diversity of aquatic resources in their diet. These resources are high in critical brain-selective nutrients that may have relaxed selective pressures to allow for expansion of hominin brain size. These specific nutrients would have been important given the physiological constraints of increasing brain and body size. Evidence of aquatic resource use in many Pleistocene localities is sparse and we explore possible explanations for this. We believe the data from the Turkana basin suggest that an increase in the diversity of dietary adaptations was important to the success of our ancestors prior to the appearance of *H. erectus*.
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The chemistry of omega-3 fatty acid, docosahexaenoic acid (DHA), is critical for human brain function.

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The omega-3 DHA is special among fatty acids. It comprises more than 1% of the dry weight of brains of all species including that of humans. When dietary omega-3 fatty acids are absent during brain development, they are replaced by the closest structural analogues that can be made from omega-6 fatty acids. DHA is found as a component of phospholipids in neuronal cell membranes, particularly the synapses. We hypothesized that a lack of DHA in specific modern diets leads to cognitive deficits, and that redundant molecular systems would be limited in their ability to synthesize DHA from plant-based precursors. Supporting this hypothesis are dozens of studies including our own showing that omega-3 deficiency causes visual, cognitive, motor, and mood-related deficiencies, indicating that DHA is especially crucial for proper higher neural function. These observations predict that molecular mechanisms for upregulating DHA synthesis would be limited in humans. This hypothesis is supported by our data showing that the key biosynthetic enzymes, the desaturases, are upregulated when