Notre Dame researcher sheds light on how jaws evolve

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Matt Ravosa with a llama.

(Phys.org) -- If you're looking for information on the evolution and function of jaws, University of Notre Dame researcher Matt Ravosa is your man.

His integrative research program investigates major adaptive and morphological transformations in the mammalian musculoskeletal system during development and across higher-level groups. In mammals, the greater diversification and increasingly central role of the chewing complex in food procurement and processing has drawn considerable attention to the biomechanics and evolution of this system. Being among the most highly mineralized, and thus well-preserved, tissues in the body, craniodental remains have long been used to offer novel insights into the behavior and affinities of extinct organisms.

Ravosa feels that the study of mandibular symphysis, which is the midline joint between the left and right lower jaws, is one of the most interesting and complex articulations in the bodies of mammals. This is due to the remarkable evolutionary and postnatal variation in the degree of fusion, or the amount of hard versus soft tissue, in this joint. For instance, humans, apes and monkeys all have a bony symphysis, which differs from the condition observed in most other living and fossil primates.

In two papers about adaptive and non-adaptive influences on mandibular evolution with his postdoctoral fellow Jeremiah Scott, Ravosa and his colleagues present analyses based on more than 300 species and 2,900 individual mandibles from highly diverse mammal groups where the feeding behavior of living species is well-documented.

Ravosa is particularly interested in determining if there is a relationship between the properties of food being consumed and the degree of fusion of the jaw. His recent paper in the *Journal of Evolutionary Biology* is the most broad-based examination to date relating dietary properties of mammals to the degree of fusion. His research reveals that in the case of marsupials, carnivorans and strepsirrhine primates that eat harder, tougher and bigger foods have a lesser degree of fusion. By contrast, animals that consume softer, smaller foods do not have as great a degree of fusion. This supports biomechanical arguments that fusion strengthens the symphyseal joint during postcanine chewing and biting.

In another paper appearing in the journal *Evolution*, Ravosa reports that in some bat lineages, the fusing of the jaw can be evolutionarily constrained as its morphology does not vary as a function of dietary products. Such evidence about limits on musculoskeletal variation is typically rare in mammals, with these findings having important implications regarding the evolution of the feeding apparatus in humans and other anthropoids. Though dietarily diverse, all members of this primate group exhibit a fused symphysis that also does not vary with diet.

Ravosa notes that similar analysis of other species would further help our understanding of the evolution and development of the mammalian skull, which includes his lab's ongoing anatomical, imaging, cellular, molecular and engineering approaches to determinants of jaw-joint formation, aging and pathology.

Provided by University of Notre Dame

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