The 88th Annual Meeting of the American Association of Physical Anthropologists (2019)

Skeletal microstructure growth dynamics in ancient humans and fossil rats from Indonesian islands

JUSTYNA J. MISZKIEWICZ[1], PATRICK MAHONEY[2], JULIEN LOUYS[3], SUE O'CONNOR[4], CHELSEA MORGAN[1], BRONWYN WYATT[1] and PETER BELLWOOD[1].

[1]School of Archaeology & Anthropology, Australian National University, [2]School of Anthropology & Conservation, University of Kent, [3]Australian Centre for Human Evolution, Griffith University, [4]Archaeology & Natural History, Australian National University

March 28, 2019 ,

Substantial evidence exists for insularity manifesting in living populations, but little is known about its effect on skeletal growth dynamics in prehistoric humans and other animals. Here, we reconstruct: 1) femur bone metabolism in ten Timor Island giant and small fossil (late Quaternary ca. 5-18 ka) rats, 2) human femur and occipital bone, and tooth enamel growth links in three adult males of 152.9-164 cm stature, recovered from the Maluku Islands (BCE/CE junction Morotai, 2314–1415 cal. BP Gebe). Osteocyte lacunae density (Ot.Dn) and secondary osteon parameters were recorded in midshaft femur and nuchal crest occipital bone histological sections. Lateral enamel daily secretion (DSR) and root extension rates were calculated from upper first and second human molar histology. Results reveal significant (p<0.001) and negative relationships between Ot.Dn and rat body size, with giant specimens showing low Ot.Dn (Rho min. = -0.891, max. = -0.976). The DSR of 3.9μm (mid-enamel) to 4.6μm (outer enamel) for the human crowns is similar to modern day molars, but the daily extension rate of 7.61μm over the first 2 mm of root growth is faster than the rate roots form over this distance in modern clinical samples. Remodelling data indicate increased bone deposition (21.18–27.86#/mm^2) despite the short adult stature. Findings from our ancient human and rat model experiment suggest that island living may affect internal dynamics of skeletal growth. Giant rats may have slowed down their bone metabolism, whereas short humans increased their growth rates to facilitate a physiological adaptation to island environments.