

Pecha Kucha Presentation Session 1, Thursday 11:30-12:45

Pitting enamel defects offer novel phylogenetic interpretations for early hominins

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Pitting enamel defects described commonly on the post-canine teeth of *Paranthropus robustus* have been considered to have a genetic component to their formation [1]. Similar defects are not found in other hominin taxa in South Africa, and, as yet, have not been described in other hominins or primates more generally. In this study, we assess pitting enamel hypoplasia (PEH) in isolated dental remains from the Omo in present day Ethiopia [2], and compare these results to the pattern and frequency of PEH in other hominin taxa in eastern and southern Africa. PEH was scored for 83 isolated Omo teeth with complete crowns and not showing substantial post-mortem damage. No anterior teeth (incisors or canines) show PEH, and therefore frequencies are compared for posterior teeth only.

The results show PEH was relatively common in the posterior teeth (premolars and molars) of the Omo hominins, although they were not evenly distributed across the stratigraphic deposits or species/genera represented. Eight permanent teeth (8 of 29) assigned to robust species (*P. boisei* and *P. aethiopicus*) show PEH, spread over a wide range of Omo stratigraphic units in which they are represented in (teeth with PEH range from ~2.9 Ma to 1.9 Ma). Additionally, seven Omo deciduous teeth also display PEH, with at least three belonging to the robust lineage, and the others at present not assigned to a particular hominin taxa/group, giving a minimum of 11 Omo teeth with PEH attributed to *Paranthropus*. Unexpectedly, in the earliest deposits (Omo stratigraphic level B, approximately 3.0 Ma), the non-robust hominin material (likely representative of *Australopithecus afarensis*), also show PEH (5 of 15 permanent posterior teeth). Specimens assigned to later non-robust hominins (including early *Homo* and potentially different species) do not show pitting (Omo stratigraphic levels C to L: 2.9 Ma – 1.1 Ma; N=32 permanent posterior teeth).

The PEH observed in these 20 Omo samples (both in robust and non-robust specimens) is remarkably similar to those observed in *P. robustus*, and affects the same crown locations, and same teeth at similar severity and prevalence. Given the uniform nature of these defects across these taxa, and lack of defects in other groups, our results strongly suggest a shared aetiology. Interestingly, no PEH resembling these have been found in any extant primate sample, or specimens belonging to the genus *Homo*. We therefore hypothesize that, given the uniform nature of defects among post-canine teeth (including permanent premolars and molars, and deciduous molars), and lack of PEH on incisors and canines in both eastern and southern African samples, a common genetic effect is the cause. An environmental factor may still be required to initiate PEH formation, and therefore further research is required to assess this possibility. If the genetic hypothesis is supported through further investigation, these pitting enamel defects may offer novel phylogenetic insights into the hominin family tree, since it seems unlikely a potentially deleterious and unique phenotype may evolve independently multiple times solely within the hominin lineage. Therefore, our results offer support to the hypothesis that the robust hominin species in eastern and southern Africa evolved from *A. afarensis*. Given that we observed no pitting defects in the large sample of *A. africanus*, these data do not support the interpretation that the robust hominin species in southern Africa derived from *A. africanus*. Given the presence of PEH in the posterior teeth of *A. afarensis*, which are relatively small in size, these defects likely do not relate to the rapid evolution of hyper-thick enamel and large posterior teeth in *Paranthropus*, as previously proposed. Other pleiotropic effects should instead be considered to explain why these pitting defects remained common over such a long period.

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References: [1] Towle, I., Irish, J.D., 2019. A probable genetic origin for pitting enamel hypoplasia on the molars of *Paranthropus robustus*. *Journal of Human Evolution* 129, 54-61. [2] Boissieric J-R, Guy F, Delagnes A, Hlusko LJ, Bibi F, Beyene Y, Guillemot C. 2008. New palaeoanthropological research in the Plio-Pleistocene Omo Group, Lower Omo Valley, SNNPR (Southern Nations, Nationalities and People Regions), Ethiopia. *Comptes Rendus Palevol* 7, 429-439.