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The biorhythm of human skeletal growth

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Evidence of a periodic biorhythm is retained in tooth enamel in the form of Retzius lines. The periodicity of Retzius lines (RP) correlates with body mass and the scheduling of life history events when compared between some mammalian species. The correlation has led to the development of the inter-specific Havers–Halberg oscillation (HHO) hypothesis, which holds great potential for studying aspects of a fossil species biology from teeth. Yet, little is known about the potential role of the HHO for human skeletal growth. Here, we explore this hypothesis within a sample of human skeletons. Associations are sought between the biorhythm and two hard tissues that form at different times during human ontogeny, using standard histological methods. First, we investigate relationships of RP to permanent molar enamel thickness and the underlying daily rate that ameloblasts secrete enamel during the early childhood years. Second, we develop preliminary research previously conducted on small samples of adult human bone by testing associations between RP, adult femoral length, and the rate of osteocyte proliferation. Results reveal RP is positively correlated with enamel thickness, negatively correlated with femoral length, but weakly associated with the rate of enamel secretion and osteocyte proliferation. These new data imply that a slower biorhythm predicts thicker enamel for children but shorter stature for adults. Our results develop an intra-specific HHO hypothesis suggesting a common underlying systemic biorhythm has a role in the final products of human enamel thickness and femoral length, probably through the duration rather than the rate of growth.