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Inter-population differences in enamel secretion rates: a comparison between modern and ancient populations

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Human enamel growth occurs as ameloblast cells secrete and mineralize protein matrix. Studies of enamel daily secretion rates (DSRs) have yielded significant insights into the evolution of permanent tooth enamel across hominin species. However, inter-population variation of modern human permanent enamel DSRs has received less attention, particularly for anterior tooth types.

This study utilizes dental histological thin sections to examine DSRs calculated for lateral and cuspal enamel regions for permanent molar, canine, and incisor crowns from British populations. These samples date from the Roman (70-400AD), Early-Anglo Saxon (500-600AD), Late Anglo- Saxon (800-1200AD), Medieval (1100-1500AD), and modern day period. A total of 338 teeth were analyzed: molar (n=89), canine (n=69), incisor (n=80). Results display consistent and significant trends towards decreasing DSRs from the ancient to modern populations. This was observed in all molar cuspal ($p < 0.00$), lateral mid ($p < 0.01$) and outer ($p < 0.00$) regions, in all incisor cuspal and lateral regions (all $p < 0.00$), and in all canine cuspal and lateral regions (all $p < 0.00$). These data provide the first evidence for a change in the daily rate of enamel growth in human permanent dentition, in multiple permanent tooth types, over a 2000 year period. This alludes to a previously unidentified plasticity in modern human enamel growth. Ongoing research will investigate whether similar variation has occurred in other enamel variables over this period of time in these populations.