Catching Fire: Geochemical evidence suggests hominin-controlled fire during the Pleistocene in the Turkana Basin, Kenya

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Abstract
What sparked the use of fire by human ancestors? The advent of pyrotechnology, or human use of fire, is a hotly debated topic with a broad range of implications that include human-ecosystem interactions as well as combustion-mediated dietary changes that led to increased encephalization in the genus Homo. Fire plays an essential role in maintaining modern grassland and savanna ecosystems and was an important for their establishment in the late Neogene (Karp et al., 2018). Furthermore, the use of fire by human ancestors may have significantly impacted the biological trajectory of our species (Wrangham et al., 1999). Despite the critical role of fire in establishing and maintaining these ecosystems and its potentially vital role in human evolution, it has left only subtle traces in the sedimentary record. Demonstrating the occurrence of fire in deep time, and especially inferring hominin control of fire, has numerous challenges that are best met with a multiproxy approach.

Here, we evaluate the presence of combustion at archaeological sites using pyrogenic polycyclic aromatic hydrocarbons (PAHs) extracted from terrestrial and lacustrine sediments from the Turkana Basin. We test for evidence for combustion at archeological sites (~2.8 to 1.5 Ma) and at coeval sites where evidence for hominin activity is lacking. We find elevated PAH concentrations (primarily fluoranthene and pyrene) at the archaeological site of FxJj20 AB (~1.5 Ma), compared to PAH concentrations in coeval deposits with no evidence of hominin activity or occupation. The PAH data support previous work at FxJj20 AB that includes FTIR analyses of sediments and bones, soil micromorphology, thermal fracture of stone tools, and magnetic susceptibility of soils (Hlubik et al. 2019, Cutts, et al. 2019). The combined evidence supports the assertion that hominins interacted with fire at this locale. Evaluation of fire occurrence at the regional scale using PAH analyses of sediments from the West Turkana drill core (HSPDP-WTK13-1A) will provide a baseline for evaluating pyrotechnology from archeological sites in the basin.

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