

Synchrotron X-ray Fluorescence Reveals Melanosome Trace Element Chemistry in Vertebrates and Invertebrate Chordates

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Melanosomes are organelles in vertebrate cells that contain melanin, a pigment often associated with various metal ions. Melanosomes are highly resistant to diagenesis and persist in the vertebrate fossil record, and have been used to infer taxonomy. In the vertebrate eye melanosomes occur in three distinct tissues: the retinal pigment epithelium (RPE), choroid and iris. Among these tissues melanosome geometry can differ. Whether melanosome geometry can reliably discriminate these ocular tissues is, as yet, unknown. Here we use synchrotron-based X-ray fluorescence (XRF) to elucidate and compare trace element chemistry of melanosomes among different tissues of the eye and in the head in various vertebrates and invertebrate chordates. Our results reveal that specific suites of trace elements are associated with different tissues both within and among taxa. These data will help constrain the extent to which melanosomes in the vertebrate eye can be used to infer taxonomy.