905

TOWARD DEEPER UNDERSTANDING COLOR VISION OF HOWLER MONKEYS

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The routinely trichromatic color vision is an important characteristic of catarrhines (Old World monkeys, apes and humans). This is achieved by having an autosomal S opsin gene and X-linked L and M opsin genes. In most New World monkeys, the X-linked opsin is encoded by a single-copy L-M opsin gene which has an extensive allelic diversity, resulting in highly polymorphic color vision. Among New World monkeys, however, howler monkeys (*Alouatta*) are known as an exception having L and M opsin genes on the same X chromosome and are considered to have a routine trichromacy. A previous *in vivo* (electroretinogram; ERG) measurement of howlers' visual sensitivity indicated that the sensitivity was explainable if the L and M opsins of howlers had similar spectral sensitivities with those of catarrhine, respectively, and both were expressed. However, spectral sensitivities of the howlers' L and M opsins have not been directly measured and their entire nucleotide sequences have not been determined. To deepen our understanding the evolution of this interesting parallelism, it is necessary to investigate the L and M opsin genes of howlers for absorption spectra, expression patter in the retina and nucleotide variation in populations. As a first step, we aim to measure their absorption spectra. To achieve this non-invasively, we PCR-amplified all six exons of the L and M opsin genes of mantled howlers (*A. palliata*) from fecal DNA collected in Santa Rosa National Park, Costa Rica. We plan to reconstitute these photopigments and measure their absorption spectra *in vitro*.

Keywords: *Alouatta*, Routine trichromatic color vision, Opsin, Absorption spectra