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ARTICLE

Photopigment transmittance imaging of the primate photoreceptor mosaic

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We introduce a new technique for classifying many photoreceptors simultaneously in fresh, excised primate retina on the basis of their absorptance spectra. Primate retina is removed from the pigment epithelium and illuminated under a microscope from the same direction as in the intact eye. To facilitate the guiding of light into the receptor outer segments, the optical axes of the photoreceptors are oriented parallel to the optical axis of the microscope. Photoreceptor outer-segment tips are imaged on a charge-coupled device array, which provides radiometric measurements of the light passing through each photoreceptor. These images are acquired sequentially at three wavelengths chosen to maximize the absorptance differences among the three cone photopigments. After the photopigment is bleached, a second set of three images is acquired. The ratios of the images before and after bleaching at each wavelength are photopigment transmittance maps of the retina. These are combined into a single trichromatic image showing the distribution of photopigment if the retina could be viewed directly in white light without bleaching. We have found patches of receptors in peripheral macaque retina where the measured absorptance at the wavelength of maximum absorptance is consistent with the predicted axial absorptance of th photopigment. The cones in these patches cluster into two groups corresponding to the middle wavelength- sensitive (n = 53, mean absorptance = 0.28) and the long wavelength-sensitive (n = 63, mean absorptance = 0.30) cones. The mean absorptances of 273 macaque and 183 human rods were 0.51 and 0.41, respectively.

This article has been cited by other articles:

- Chichilnisky, E. J., Kalmar, R. S. (2002). Functional Asymmetries in ON and OFF Ganglion Cells of Primate Retina. *J. Neurosci.* 22: 2737-2747 [Abstract] [Full Text]
- Chander, D., Chichilnisky, E. J. (2001). Adaptation to Temporal Contrast in Primate and Salamander Retina. *J. Neurosci.* 21: 9904-9916 [Abstract] [Full Text]

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