Researchers id new class of photoreceptors

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The identification of a new class of photoreceptors in the retina of fruit flies sheds light on the regulation of the pigments of the eye that confer color vision, researchers at New York University's Center for Developmental Genetics report in a new study appearing in the Public Library of Science's journal, *PloS Biology*. The findings, they write, may also have implications for the regulating of olfactory receptors, which are responsible for the detection of smells, because both types of receptors belong to the same protein family.

Biologists have previously found that most sensory systems follow the "one receptor molecule per receptor cell" rule. For example, photoreceptors in the fly eye and human cones—our color-sensitive photoreceptors—each express only one rhodopsin, a pigment that is sensitive to only one color. Rhodopsins are G-coupled protein receptors, a class of ancient signaling molecules that mediate not just vision, but also the sense of smell and other physiological processes.

In the PloS Biology study, the NYU researchers examined the eye of the fruit fly Drosophila. Fruit flies can be analyzed and manipulated in exquisite details by biologists and serve as a powerful model system to understand biological processes such as vision. In each of the estimated 800 individual facets that make up the fly eye, there are eight photoreceptors (R1–R8). Six of these mediate broad-spectrum detection of motion (R1–R6) and two mediate color vision (R7 and R8) and are similar to the human cone photoreceptors.

The NYU researchers, headed by Biology Professor Claude Desplan,

sought to understand the mechanisms that regulate mutual exclusion of rhodopsin photoreceptor genes in the fly retina, which is poorly understood. Their results revealed a new class of photoreceptors that violates the one rhodopsin–one photoreceptor rule. This new class, located in the dorsal third of the eye, co-expresses two ultraviolet (UV)-sensitive rhodopsins (rh3 and rh4) in R7, while maintaining discrimination between green and blue rhodopsins in R8.

The NYU researchers found that this co-expression depends on a group of genes—the so-called Iroquois Complex genes—that are known to specify the dorsal side of the eye. These genes are necessary and sufficient to allow the two UV-sensitive rhodopsins to be expressed in the same R7 cell. The purpose of this co-expression of UV-sensitive pigments in a specialized part of the dorsal retina is likely to allow the flies to better orient to the sun for navigation: Flies, like bees, where this has been well documented, can discriminate between the solar side of the landscape, which has fewer radiations in the UV, and the opposite side (anti-solar), which is very UV-rich.

Source: New York University