東京大学大学院理学系研究科
生物化学専攻／GCOE セミナー

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演題：

Phototransduction in rods and cones of the vertebrate retina

日時：平成 23 年 7 月 25 日（月）13：30～15：30
場所：東京大学理学部 3 号館 4 階 416 号室

The rod and cone photoreceptor cells of the vertebrate retina transduce light into a neural signal using closely similar cellular and molecular mechanisms, though with a number of subtle differences that together endow the cell types with distinctive functional properties. Cones mediate vision over most light levels, providing relatively high-speed responses; importantly, they adapt over an enormously wide range of light intensities and never saturate during steady illumination. Rods operate under extremely low light conditions, and reliably detect individual photons of light; they saturate once the intensity of illumination exceeds twilight levels.

The molecular mechanism of transduction in vertebrate photoreceptors is understood in detail. Light-activated rhodopsin catalyses the activation of the G protein transducin, which in turn activates a PDE, thereby hydrolysing cyclic GMP and closing ion channels in the plasma membrane and shutting-off the "dark current" of cations. Using this knowledge it is possible to predict the waveform of the photoreceptor's response to light.

Rods and cones differ anatomically, in the topology of the outer segment membrane. In addition there are differences in the proteins of phototransduction. Some of these proteins are expressed as rod- and cone-specific isoforms, whereas others are identically the same protein in rods and cones; in addition, the expression levels may differ significantly between rods and cones.

For some of these differences in cellular and molecular make-up of rods and cones, it is possible to predict differences in functional properties of the cell types. Soon it may be possible to account for all of the physiological differences betweens rods and cones.

Reference

Lamb, T.D. & Pugh, E.N. Jr (2006). Phototransduction, dark adaptation, and rhodopsin regeneration. The Proctor Lecture. *Invest. Ophthalmol. Vis. Sci.* **47**, 5138-5152.

Lamb, T.D., Collin, S.P. & Pugh, E.N. Jr (2007). Evolution of the vertebrate eye: Opsins, photoreceptors, retina, and eye-cup. *Nat. Rev. Neurosci.* **8**, 960-975.

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