



# CDB SEMINAR

## Akihiro Yamanaka

National Institute for Physiological Sciences

Monday, July 11, 2011

16:00~17:00 A7F Seminar Room

### **Sleep/wakefulness control using optogenetics in mice**

#### **Summary**

Orexin/hypocretin neurons have a crucial role in the regulation of sleep and wakefulness. Although the afferent and efferent connections of these neurons have been determined, how orexin neuronal activity promotes wakefulness is incompletely understood. To further examine the role of orexin neuronal activity in sleep/wakefulness regulation, we generated transgenic mice in which orexin neurons expressed halorhodopsin, an orange light-activated chloride ion pump. Slice patch clamp recordings of orexin/halorhodopsin neurons demonstrated that photic illumination produced an outward current, hyperpolarized, and reduced the discharge rate of orexin neurons in a wavelength- and intensity-dependent manner. Acute silencing of orexin neurons *in vivo* by orange light illumination decreased electromyography power and increased the delta frequency in the electroencephalogram, indicative of slow wave sleep (SWS), and was time-of-day dependent. These findings suggest that activation of orexin neurons is necessary to keep animals awake during the light period.

#### **Host:**

**Takeshi Imai**

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