The circadian clock regulates physiological functions through a neuropeptide PDF in the cricket *Gryllus bimaculatus*

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Pigment-dispersing factor (PDF) is a neuropeptide that is widely found in the brain of various insects. We have investigated the role of PDF in the circadian system of the cricket, *Gryllus bimaculatus* and found its multiple roles. There are three groups of PDF producing cells in the cricket's optic lobe. One of them, the PDFMe cells located in the proximal medulla, innervates wide areas of the protocerebrum as well as the medulla neuropil. The PDF content is under the regulation of the circadian clock, showing a rhythmic change increasing during the night. Electrophysiological and pharmacological experiments revealed that PDF enhances photoresponsiveness of visual interneurons and set the night state of the visual system. We recently found that PDF is also involved in the regulation of the locomotor rhythm. When PDF levels are reduced by RNA interference, nocturnal activity is severely reduced, the free-running period is shortened in constant darkness, and photic-entrainability is enhanced. PDF knock-down also reduces the amplitude of the circadian oscillation of some clock genes. Thus, the circadian clock regulates the visual system and nocturnal locomotor rhythms at cellar and molecular levels through the PDF system.