

Internal Desynchronization of biological clocks in the Suprachiasmatic Nucleus (SCN) and Ventral Tegmental Area (VTA) as a property of drug-seeking and addiction

Alex Bond

Cocaine is a highly addictive and abused drug, yet the mechanisms of drug-seeking behavior, intake control, tolerance, and relapse remain unclear. Increasing evidence supports a direct association between circadian patterns and the reward circuitry in the brain, suggesting that drug addiction is modulated by temporal cues (i.e. time of day or time of year). In fact, the disruption of clock genes, the molecules responsible for generating biological rhythms, has been shown to influence drug-seeking behavior in several species. My study seeks to elucidate the development of internal desynchronization between clock gene rhythms in two key brain areas, the suprachiasmatic nucleus (SCN; site of the body's 'master' clock) and ventral tegmental area (VTA; necessary for cocaine addiction), and the role this phenomenon may have in the development of drug-seeking behaviors. Using a transgenic *Per1luc* rat model, in which the clock gene *Period 1 (Per1)* promoter region has been linked to a luciferase reporter, clock functions in the specified brain regions can be monitored *in vivo*. Bioluminescence recordings of the VTA and SCN in rats performing cocaine self-administration will allow us to establish whether the VTA is directly responsive to cocaine, independent of SCN-entrainment. The results of my study could reveal a novel explanation for the role of biological clocks in the development of drug-seeking behaviors and addiction.