1128-92-317 **Michael J. Rempe*** (mrempe@whitworth.edu), Whitworth University, Dept. of Mathematics and Computer Science, Spokane, WA 99251, **Jonathan P. Wisor** (j_wisor@wsu.edu), Sleep and Performance Research Center, Washington State University, Spokane, WA 99210, and **Janne Gronli** (janne.gronli@uib.no), Dept. of Biological and Medical Psychology, University of Bergen, 5009 Bergen, Norway. *Mathematical Modeling of sleep-wake state dynamics in a rodent model of night shift work.*

Millions of people worldwide are required to work during the times when their bodies are primed for sleep. This disruption of the body's normal sleep and circadian rhythmicity related to the work schedule may mediate the relationship between shift work and numerous adverse health consequences (i.e. insomnia, metabolic disturbances, digestion problems). Here, we simulate shift work in rodents and model the data with a simple system of differential equations containing 1) a circadian process, 2) a homeostatic process and 3) a stochastic process to mimic the rodent's polyphasic sleep pattern. The model correctly reproduces sleep state bout durations and sleep state percentages of rat sleep under baseline and working conditions. By changing only the time at which the rodents are forced to be awake, the model reproduces some key changes in the sleep-wake pattern measured by brain activity. Also, the Markov Chain model suggests that the shorter sleep episodes recorded in 'night workers' as compared to 'day workers' is due to circadian effects. Mathematical modeling of sleep – wake state dynamics allows for deeper insight into the circadian and homeostatic processes of sleep regulation in behavioral induced sleep disruption. (Received February 28, 2017)