Study shows changing sleeping patterns can alter gene expression cycles

January 21 2014, by Bob Yirka

Credit: Maurajbo/Wikipedia.

(Medical Xpress)—Researchers at the University of Surrey in the U.K. have found that drastically altered sleep schedules (such as switching to working a night shift) can dramatically impact gene expression rhythm. In their paper published in *Proceedings of that National Academy of Sciences*, the team describes a sleep study they conducted with volunteers and the striking results they found regarding the impact of changing sleep patterns on gene expression.

Scientists know that our genes are responsible for causing the creation of

proteins and other chemicals necessary for us to function. They also know that such gene expression is cyclic—sometimes more is expressed, sometimes less, depending on the time of day. What they don't know is what happens when these internal cycles are disrupted.

Also, most people know that their body operates on an internal clock—it lets them know when to eat, sleep and when to expect to be alert, or not. What's still not clear, however, is what happens to our internal clock when we disrupt one of those actives—specifically sleep. To learn more, the researchers enlisted the assistance of 22 young volunteers who each agreed to sleep at the study center for three days while their natural clocks were altered.

To alter the day/night clocks of the volunteers, the researchers turned out the lights four hours earlier each night, which put them at the end, twelve hours off. That meant they were sleeping in the daytime and awake at night. The researchers also took blood samples throughout the study to test for signs of an impact on gene expression.

In studying the results afterwards, the research team found that all but 40 of 1,396 genes tested in the volunteers showed changes in expression activity times. They found also that 180 genes that normally abide by constant expression, suddenly became erratic. The team suggests their study shows that people who work night shifts or experience jet lag due to flying to distant places, suffer a "profound disruption" to the cyclical nature of gene expression. They add that their findings likely explain why people complain of a wide variety of maladies when their sleep cycle is disrupted.

Most people eventually resort to normal after experiencing jet lag if they stay in one place long enough, suggesting that the impact on gene expression is temporary, though it's still not clear if all impacted genes return to normal, or if not, which ones don't.

More information: Simon N. Archer, Emma E. Laing, Carla S. Möller-Levet, Daan R. van der Veen, Giselda Bucca, Alpar S. Lazar, Nayantara Santhi, Ana Slak, Renata Kabiljo, Malcolm von Schantz, Colin P. Smith, and Derk-Jan Dijk. "Mistimed sleep disrupts circadian regulation of the human transcriptome," *Proceedings of the National Academy of Sciences*. DOI: 10.1073/pnas.1316335111

Press release