Mia Masserio

# Circadian Clock's Effect on Recovery from TBI

Traumatic brain injuries (TBI) affect an estimated 69 million people worldwide per year, ranging from mild concussions to fatal injuries. TBI can affect the brain cells temporarily or cause long-term damage depending on the severity; however, either way, it is necessary to optimize healing. The NG2-glia cell or oligodendrocyte precursor cell is the most common cell to re-new throughout adult life, especially during the first week after a brain injury. Research shows that the time of day is a factor in the regeneration of some cells due to the circadian clock. A circadian clock is the body's 24-hour daily rhythm. Vittorio Gallo, Ph.D., interim chief academic officer and interim director of the Children's National Research Institute stated that "It is essential for researchers to know that cell renewal is coordinated with the time of day."

The body's circadian clock allows for necessary functions to be completed, including sleeping and a multitude of other physical, mental, and behavioral changes. The circadian clock regulates temperature as well and depends on environmental factors such as daylight and darkness. Some cells regenerate according to circadian rhythms, optimizing their ability to proliferate depending on the time of day. This includes the NG2-glia cell, which is important to consider when optimizing recovery after injury. The circadian clock's effect on the renewal of the NG2-glia cells occurs not only after injury but also regularly.

Research shows that body temperature is a factor in the level of consciousness of a person with TBI. Dr. Christine Blume of the University of Salzburg in Austria, the study author, stated, "Our study suggests that the closer the body temperature patterns of a severely brain injured person are to those of a healthy person's circadian rhythm, the better they scored on tests of recovery from coma." Along with this, researchers also measured consciousness and found

that those with better responses to sound and a better ability to open their eyes had well-regulated circadian clocks and therefore, body temperatures that follow closest to a 24-hour rhythm. This demonstrates the importance of keeping circadian rhythms in mind when planning for an optimized recovery. To ensure that a patient's circadian clock is functioning at its best, doctors should consider simulating natural light patterns in order to increase a patient's level of consciousness.

Bibliography


Beker, Mustafa Caglar, et al. "Time-of-Day Dependent Neuronal Injury After Ischemic Stroke: Implication of Circadian Clock Transcriptional Factor Bmal1 and Survival Kinase AKT." *Molecular Neurobiology*, vol. 55, no. 3, Mar. 2018, pp. 2565–76. *Springer Link*, https://doi.org/10.1007/s12035-017-0524-4.

Blume, Christine, et al. "Significance of Circadian Rhythms in Severely Brain-Injured Patients: A Clue to Consciousness?" *Neurology*, vol. 88, no. 20, May 2017, pp. 1933–41. *DOI.org (Crossref)*, https://doi.org/10.1212/WNL.0000000000003942.

"New Clues into How the Circadian Clock Helps the Brain Recover after Injury." *ScienceDaily*, https://www.sciencedaily.com/releases/2022/09/220919144017.htm. Accessed 21 Oct. 2022.

"Study: Injured Brain's Ability to Heal May Hinge on Time of Day, Circadian Rhythms." *UPI*, https://www.upi.com/Science_News/2022/09/19/traumatic-brain-injury-circadian-rhythm-healing-study/1081663601119/. Accessed 21 Oct. 2022.

"Traumatic Brain Injury - Symptoms and Causes." *Mayo Clinic*, https://www.mayoclinic.org/diseases-conditions/traumatic-brain-injury/symptoms-causes/syc-20378557. Accessed 21 Oct. 2022.