# Time of day affects severity of autoimmune disease

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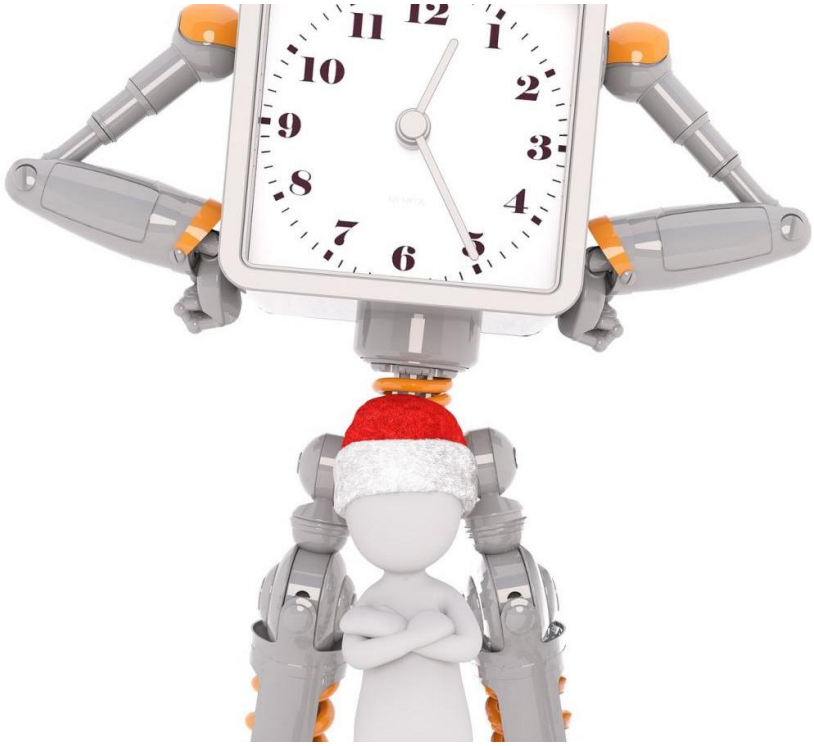

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Insights into how the body clock and time of day influence immune responses are revealed today in a study published in leading international journal *Nature Communications*. Understanding the effect of the interplay between 24-hour day-night cycles and the immune system may help inform drug-targeting strategies to alleviate autoimmune disease.

Circadian rhythms or 24-hour rhythms are generated by the body clock, allowing us to anticipate and respond to the 24-hour cycle of our planet. Maintaining a good body clock is generally believed to lead to good health for humans, and disrupting the circadian rhythm (for example, working night shifts) has been associated with immune diseases such as multiple sclerosis; however, the underlying molecular links have been unclear.

In the new study, Professor Kingston Mills and Dr Caroline Sutton of Trinity College Dublin, and Dr Annie Curtis of RCSI (Royal College of Surgeons Ireland), and colleagues show that immune responses and regulation of autoimmunity are affected by the time of the day when the immune response is activated.

Using mice as a model organism, they show that a master circadian gene, BMAL1, is responsible for sensing and acting on time-of-the-day cues to suppress inflammation. Loss of BMAL1, or induction of autoimmunity at midday instead of midnight, causes more severe experimental autoimmune encephalomyelitis, which is essentially an analogue of multiple sclerosis in mice.

Professor of Experimental Immunology at Trinity, Kingston Mills, said: "In the year that the Nobel Prize in Medicine was awarded for discoveries on the molecular mechanisms controlling the circadian rhythm, our exciting findings suggest that our immune system is programmed to respond better to infection and insults encountered at different times in the 24-hour clock. This has significant implications for the treatment of immune-mediated diseases and suggests there may be important differences in time of day response to drugs used to treat autoimmune diseases such as multiple sclerosis."

Although further investigations are needed to understand how to precisely modulate circadian rhythm or time-of-the-day cues for

beneficial immunity, the findings in this article serve well to remind us the importance of 'keeping the time' when dealing with the immune system.

Research Lecturer in the Department of Molecular and Cellular Therapeutics at RCSI, Dr Annie Curtis, said: "Our study also shows how disruption of our body clocks, which is quite common now given our 24/7 lifestyle and erratic eating and sleeping patterns, may have an impact on autoimmune conditions."

"We are really beginning to uncover exactly how important our body clocks are for health and wellbeing."

**More information:** Caroline E. Sutton et al, Loss of the molecular clock in myeloid cells exacerbates T cell-mediated CNS autoimmune disease, *Nature Communications* (2017). DOI: 10.1038/s41467-017-02111-0

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