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## **Circadian and Circaseptan Rhythms Characterise Human Epilepsy – Clinical Implications**

It has long been suspected that epilepsy is governed by cyclic rhythms, with seizure rates rising and falling periodically over weeks to months or even years. The very long scales of seizure patterns seem to defy natural explanation and have sometimes been attributed to celestial interference, such as the movement of the moon. We studied this using two comprehensive databases of human seizures (SeizureTracker, and NeuroVista) we can now convincingly demonstrate that multitemporal cycles are significant and highly prevalent. We found that the majority (80%) of patients showed circadian (24-hour) modulation of their seizure rates. More interestingly, many patients showed strong circaseptan (weekly) rhythms, with a clear 7-day period. Furthermore, almost 1/5 of patients also had seizures cycles that were longer than three weeks. These cycles were equally prevalent in males and females, including monthly cycles. The causes of multiscale variation in seizure rates are likely to include a range of environmental and endogenous factors. Seizure cycles are robust, patient-specific, and more widespread than previously understood. Multiscale oscillations in seizure rate should be identified in clinical practice: treatment decisions may differ depending on which point in a patients' cycle assessment occurs. Detecting and tracking seizure cycles on a patient specific basis should underwrite standard epilepsy management practices. Knowledge of these cycles can be used to develop patient specific forecasting algorithms. The potential application of these finding to a minimally invasive seizure detection system currently being commercialized will be discussed.