Docket #: S21-248

A Biomarker-Informed Diagnostic Algorithm for Predicting Sleep Disorders

Stanford researchers have developed a proteomic biomarker-based algorithm for efficiently diagnosing circadian rhythm and sleep disorders. By harnessing a multivariate analysis of over 5,000 proteins in the blood, the algorithm serves as an effective predictive tool for determining internal circadian timing, sleep debt, and various forms of somnipathy.

Existing practices for the diagnosis and therapeutic follow-up of sleep disorders, including sleep apnea, hypersomnia, and restless leg syndrome, rely on sleep recordings and clinical assessments that are both lengthy and expensive to perform. Additionally, while electroencephalograms and patient performance testing can be utilized to gauge sleepiness, there is no current methodology suitable for measuring sleep debt. The inventors' machine learning-based algorithm evaluates the proteomic content of blood samples to accurately predict the subject's circadian phase, extent of sleep deprivation, the presence of treated versus untreated sleep apnea, and various subtypes of hypersomnia, among other circadian profiles. The algorithm, which analyzes the levels of roughly 5,500 protein biomarkers in the blood, has been rigorously tested and validated with Stanford clinical datasets. By offering reliable predictions of sleep disorders via a simple blood test, this diagnostic platform reduces the need for protracted and costly sleep studies at dedicated sleep clinics, streamlining the diagnosis and subsequent treatment of numerous somnipathies.

Stage of Development
Proof of Concept

Applications

- Diagnostic aid for clinicians treating patients with sleep disorders
- Research tool for scientists studying circadian timing and somnipathies
- Evaluation and monitoring of therapeutic interventions for sleep disorders

Advantages

- Significantly less expensive than conventional methods for identifying sleep disorders
- Eliminates the need for lengthy sleep studies to diagnose and monitor somnipathies
- Offers more versatile tracking and prediction of sleep hygiene information

Publications

- Adrien Specht, German Kolosov, Katie L. J. Cederberg, et al. (2024). Circadian protein expression patterns in healthy young adults. *Sleep Health*, **10**(1), S41-S51.

Patents

- Published Application: WO2025107000

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