Amino acids as a potential biomarker of sleep-wake disorders

Plasma free amino acids profiles in a model mouse of sleep-wake disorders

Disordered circadian rhythms are associated with various psychiatric conditions and metabolic diseases. We recently established a mouse model of a psychophysiological stress-induced chronic sleep disorder (CSD) characterized by reduced amplitude of circadian wheel-running activity and sleep-wake cycles, sleep fragmentation and hyperphagia. Here, we evaluate day-night fluctuations in plasma concentrations of free amino acids (FAA) in mice with CSD (CSD mice). Day-night fluctuations in plasma FAA contents were severely disrupted without affecting total FAA levels in CSD mice. Nocturnal increases in branched-chain amino acids such as Ile, Leu, and Val were further augmented in CSD mice, while daytime increases in Gly, Ala, Ser, Thr, Lys, Arg, His, Tyr, Met, Cys, Glu, and Asn were significantly attenuated. These findings suggest that plasma FFA profiles could serve as a potential biomarker of circadian rhythm disorders.

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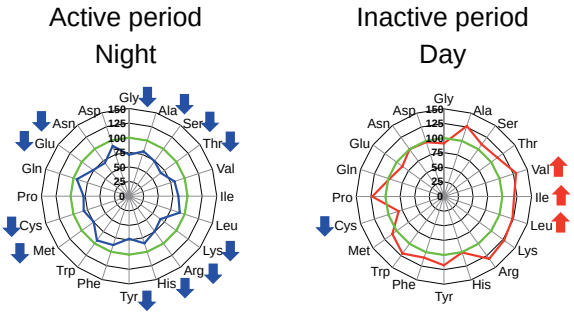

The radar charts for the relative changes in plasma FAAs
Averaged value for control mice is expressed as 100 % at each time point. Upward and downward arrows indicate significant increases and decreases, respectively, in CSD mice.

Detection of water leakage from water pipes using a learning-type sound anomaly analysis technology

Reduces labor required for water leakage inspection by skilled workers to one-fifth

We have developed a technology to narrow down the locations that must be inspected for water leakage by skilled workers with high-accuracy in advance, using a sound anomaly analysis technology which learns the workers' judgments by machine learning. Field tests have been conducted in two cities which resulted in a reduction of the inspection locations to one-fifth, compared to the past. Narrowing down the inspection locations will lead to significant reduction in inspection costs, which will provide relief to local governments that need to reduce maintenance and management costs brought on by the decline in water rate revenue due to a decrease in population. In addition, providing this as a maintenance and management technology for social infrastructure is expected to contribute to the low-cost supply of safe drinking water in countries of Southeast Asia, now suffering from a water leakage rate of over 30 %.

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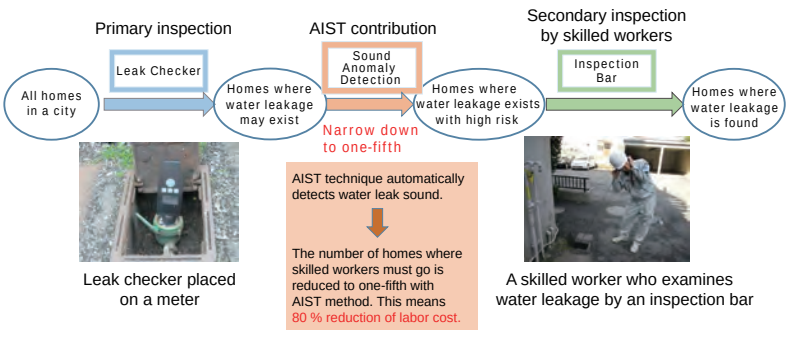

Positioning of water leakage detection through learning-type sound anomaly analysis