How to develop an animal model of stress-induced sleep disorders

Aiming at prediction of sleep disorders and elucidation of their mechanism

Chronic and social defeat types of stress induce depression and post-traumatic stress disorder (PTSD) with circadian rhythm abnormalities. So far, an appropriate experimental system that can assess circadian locomotor activity during continuous exposure to a stressor has not been established. We developed a novel system called PAWW (Perpetual Avoidance of Water on a Wheel) that expose mice to continuous stress. Continuous PAWW stress reduced the duration of daytime sleep of stressed mice, especially during the first half of the light period, and increased nighttime sleepiness. Continuous PAWW stress also simultaneously obscured sleep/wake and locomotor activity rhythms. These sleep architecture phenotypes under stress are similar to those of patients with insomnia. Circadian gene expression in the liver and muscle was unaltered, indicating that the peripheral clocks in these tissues remained intact.

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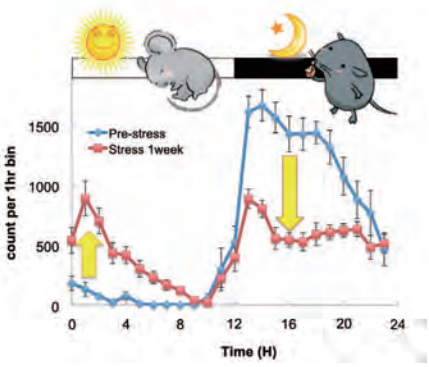
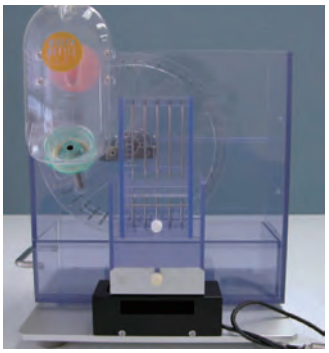


Diurnal rhythm of wheel running behavior of PAWW stressed mice



Cage for generating sleep disorder model mice (SW-15S-SD)

Development of *Euglena*-based bioplastics

Euglenoid constituent ratio of the plastics is ca. 70 %.

Euglena-based bioplastics were synthesized by introducing a long-chain fatty acid obtained from a lipid (wax ester) derived from *Euglena* to a polysaccharide (paramylon, β-1,3-glucan) produced by *Euglena*, a natural polymer consisting of glucose molecules. Euglenoid constituent ratio of the resulting bioplastics is approximately 70 %. Features of the bioplastics include high thermal plasticity and heat resistance. That is, their thermal plasticity is comparable to that of conventional bioplastics (polylactic acid and nylon 11), cellulose acetate with plasticizer, and petroleum-based ABS plastic. Heat resistance of the *Euglena*-based plastics is higher than that of these reference plastics.

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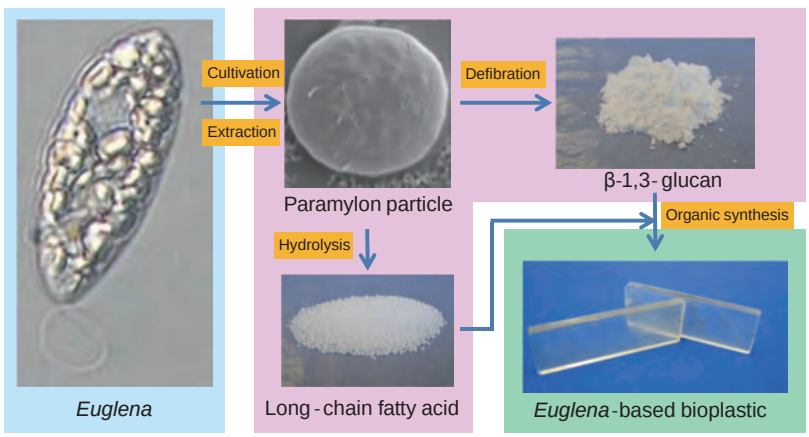

Production process of *Euglena*-based bioplastics