Sleep Wake JAX_SLW_001

Purpose

To quantitate sleep behavior in mice using automatic detection of movement with a piezoelectric floor, and threshold/statistical analysis software.

Sleep-Wake Monitoring Quad Cage and Sensor System (Signal Solutions, Lexington KY) is used to monitor mouse activity throughout a given time period. It records the amplitude of the electrical signal generated by force on the piezoelectric sensors, then uses software to set signal thresholds and statistically analyse and classify the activity as sleep or wake. Data are recorded as a confidence classification of sleep/wake over time, and include amplitude.

Experimental Design

- **Minimum number of animals :** 4M + 4F
- **Age at test:** Week 15
- **Sex:** We would expect the results of this test to show sexual dimorphism

Equipment

Signal Solutions Sensor system, Signal analysis, Software

Sleep-Wake Statistics and Analysis Toolbox (MatLab)

Procedure

Equipment Setup

1. Cages are organized by quad on a metal racking system. Each cage setup includes the foundational cage base upon which lies a rubber backing pad, piezoelectric sensor pad, and thin acetate sheet for holding bedding
2. A ½ cup mixture of 1:3 ALPHA-dri to white pine shavings is used as bedding for each cage
3. Add acidified water and 6% fat sterilized food pellets (Lab Diet® 5K67) to polycarbonate cages for animals to consume ad libitum
4. Ensure that room is on 12/12 light/dark cycle

Animal Preparation

1. Transport mice from animal room FGB4440 to the testing room FGB4435P on a rolling cart
2. Weigh each mouse prior to placing it in a testing cage and record which cage it is placed

3. Create an excel file to record each animal's cage number, LIMS test code, animal ID, strain, sex, and start and end weights, for that week's testing cohort. Throughout the test, animal welfare, room temperature and humidity, and other events will be recorded in this file.
4. Create an additional excel file with *only* the animal's LIMS test code in column A and its respective testing cage number in column B and upload this file to the MouseRec program
5. After all the mice are enclosed in their cages, lower cage bars to prevent escape
6. Set up 2 HOBO data logger units in the room to record constant temperature, light intensity, and humidity
7. Close the blackout curtains to the testing room

Experiment

1. Start the MouseRec data recording program by pressing the " start" button. The test will run from Friday mid-morning to Wednesday afternoon.
2. Check testing room daily to ensure animals have not escaped and food and water are available. Record the temperature and humidity of the room.
3. Once the test has run for a minimum of 72 consecutive hours, press the "stop" button on the MouseRec data recording program

Recovery of animals:

1. Weigh each mouse as it is removed from its respective testing cage and record end weight in that week's excel file
2. Transfer mice back to their original home cages, monitoring for aggressive behaviour
3. Equipment (cages, water bottles and floor protection sheets) must then be cleaned with soap and hot water. The piezoelectric sensor pads and quad base are wiped down with 70% ethanol.

Notes

Data is then recorded and statistically analysed by the MouseRec data recording and real—time monitoring system. That data are uploaded to the DCC by way of CSV files generated by MatLab and Sleepstats. Sleepstats is proprietary software from Signal Solutions.

Parameters and Metadata

Data confidence level JAX_SLW_001_001 | v1.2

simpleParameter

Req. Analysis: false **Req. Upload:** true **Is Annotated:** false

Sleep daily percent JAX_SLW_002_001 | v1.1

simpleParameter

Req. Analysis: false **Req. Upload:** true **Is Annotated:** true

Unit Measured: %

Sleep light phase percent JAX_SLW_003_001 | v1.1

simpleParameter

Req. Analysis: false **Req. Upload:** true **Is Annotated:** true

Unit Measured: %

Sleep dark phase percent JAX_SLW_004_001 | v1.1

simpleParameter

Req. Analysis: false **Req. Upload:** true **Is Annotated:** true

Unit Measured: %

Sleep bout lengths mean JAX_SLW_005_001 | v1.1

simpleParameter

Req. Analysis: false **Req. Upload:** true **Is Annotated:** true

Unit Measured: s

Sleep bout lengths standard deviation JAX_SLW_006_001 | v1.1

simpleParameter

Req. Analysis: false **Req. Upload:** true **Is Annotated:** true

Unit Measured: s

Light sleep bout lengths mean JAX_SLW_007_001 | v1.1

simpleParameter

Req. Analysis: false **Req. Upload:** true **Is Annotated:** true

Unit Measured: s

Light sleep bout lengths standard deviation JAX_SLW_008_001 | v1.1

simpleParameter

Req. Analysis: false **Req. Upload:** true **Is Annotated:** true

Unit Measured: s

Dark sleep bout lengths mean JAX_SLW_009_001 | v1.1

simpleParameter

Req. Analysis: false **Req. Upload:** true **Is Annotated:** true

Unit Measured: s

Dark sleep bout lengths standard deviation JAX_SLW_010_001 | v1.1

simpleParameter

Req. Analysis: false **Req. Upload:** true **Is Annotated:** true

Unit Measured: s

Activity onset with respect to dark onset median JAX_SLW_011_001 | v1.3

simpleParameter

Req. Analysis: false **Req. Upload:** false **Is Annotated:** true

Unit Measured: s

Peak wake with respect to dark onset median JAX_SLW_012_001 | v1.2

simpleParameter

Req. Analysis: false **Req. Upload:** true **Is Annotated:** true

Unit Measured: s

Breath rate during sleep mean JAX_SLW_013_001 | v1.2

simpleParameter

Req. Analysis: false **Req. Upload:** true **Is Annotated:** true

Unit Measured: s^-1

Breath rate during sleep standard deviation JAX_SLW_014_001 | v1.2

simpleParameter

Req. Analysis: false **Req. Upload:** true **Is Annotated:** true

Unit Measured: s^-1

Test duration JAX_SLW_015_001 | v1.3

simpleParameter

Req. Analysis: false **Req. Upload:** true **Is Annotated:** false

Unit Measured: h

Wake state (bmp file) JAX_SLW_016_001 | v1.0

mediaParameter

Req. Analysis: false **Req. Upload:** false **Is Annotated:** false

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Experimenter ID JAX_SLW_017_001 | v1.2

procedureMetadata

Req. Analysis: false **Req. Upload:** true **Is Annotated:** false

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Equipment ID JAX_SLW_018_001 | v1.0

procedureMetadata

Req. Analysis: false **Req. Upload:** false **Is Annotated:** false

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Equipment manufacturer JAX_SLW_019_001 | v1.0

procedureMetadata

Req. Analysis: true **Req. Upload:** true **Is Annotated:** false

Options: Robotics Center at the University of Kentucky, Signal Solutions,

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Software JAX_SLW_020_001 | v1.0

procedureMetadata

Req. Analysis: false **Req. Upload:** true **Is Annotated:** false

Options: Signal Solutions Sensory Systems, Lexington KY, SleepStats, MatLab, MouseRec,

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Start time JAX_SLW_021_001 | v1.2

procedureMetadata

Req. Analysis: false **Req. Upload:** true **Is Annotated:** false

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Diurnal Wake Ratio Median JAX_SLW_022_001 | v1.1

simpleParameter

Req. Analysis: false **Req. Upload:** false **Is Annotated:** true

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Light Onset Wake Median JAX_SLW_023_001 | v1.1

simpleParameter

Req. Analysis: false **Req. Upload:** false **Is Annotated:** true

Unit Measured: s

Daily Sleep JAX_SLW_024_001 | v1.1

mediaParameter

Req. Analysis: false **Req. Upload:** false **Is Annotated:** false

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Light/Dark Sleep JAX_SLW_025_001 | v1.0

mediaParameter

Req. Analysis: false **Req. Upload:** false **Is Annotated:** false

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Wake State Data (text) JAX_SLW_026_001 | v1.1

simpleParameter

Req. Analysis: false **Req. Upload:** false **Is Annotated:** false

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Comments JAX_SLW_027_001 | v1.0

simpleParameter

Req. Analysis: false **Req. Upload:** false **Is Annotated:** false

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Start date JAX_SLW_028_001 | v1.0

procedureMetadata

Req. Analysis: false **Req. Upload:** false **Is Annotated:** false

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