# 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 <sup>1</sup>/<sub>2</sub> 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

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: %

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#### Sleep bout lengths mean JAX\_SLW\_005\_001 | v1.1

Unit Measured: s	
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#### 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
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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		

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### 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\_01

1_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\_0

01 | v1.2 simpleParameter

Req. Analysis: false	Req. Upload: true	Is Annotated: true
Unit Measured: s		
Breath rate during	<b>sleep mean</b> JAX_SLW_	_013_001   v1.2

Req. Analysis: false	Req. Upload: true	Is Annotated: true
Unit Measured: s^-1		

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### 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

Req. Analysis: false	Req. Upload: true	Is Annotated: false	
Unit Measured: h			
Wake state (bmp filmediaParameter	<b>le)</b> JAX_SLW_016_001 ∣v1	.0	
Req. Analysis: false	Req. Upload: false	Is Annotated: false	
Experimenter ID JAX procedureMetadata	X_SLW_017_001   v1.2		
Req. Analysis: false	Req. Upload: true	Is Annotated: false	
Equipment ID JAX_SLW_018_001   v1.0 procedureMetadata			
Req. Analysis: false	Req. Upload: false	Is Annotated: false	

# 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,				
<b>Software</b> JAX_SLW_02 procedureMetadata	20_001   v1.0			
Req. Analysis: false	Req. Upload: true	Is Annotated: false		
Options: Signal Solutions Sensory Systems, Lexington KY, SleepStats, MatLab, MouseRec,				
Start time JAX_SLW_021_001   v1.2 procedureMetadata				
Req. Analysis: false	Req. Upload: true	Is Annotated: false		
Diurnal Wake Ratio Median JAX_SLW_022_001   v1.1				
Req. Analysis: false	Req. Upload: false	Is Annotated: true		

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# Light Onset Wake Median JAX\_SLW\_023\_001 | v1.1

Req. Analysis: false	Req. Upload: false	Is Annotated: true		
Unit Measured: s				
Daily Sleep JAX_SLW_ mediaParameter	_024_001   v1.1			
Req. Analysis: false	Req. Upload: false	Is Annotated: false		
Light/Dark Sleep JA mediaParameter	X_SLW_025_001   v1.0			
Req. Analysis: false	Req. Upload: false	Is Annotated: false		
Wake State Data (text) JAX_SLW_026_001   v1.1 simpleParameter				
Req. Analysis: false	Req. Upload: false	Is Annotated: false		

## Comments JAX\_SLW\_027\_001 | v1.0

Req. Analysis: false	Req. Upload: false	Is Annotated: false
Start date JAX_SLW_0	28_001   v1.0	
procedureMetadata		
Req. Analysis: false	Req. Upload: false	Is Annotated: false