

## 2.5. Rodent electrocardiogram (ECG) recording (Spurney lab)

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### A. OBJECTIVE

Obtain ECG tracings on rodents to analyze cardiac rate, rhythm and other parameters.

### B. CAUTIONS

- Cost: Both non-invasive and invasive ambulatory monitoring requires an initial investment of computer hardware to record and analyze ECG tracings.
- Even modest handling of awake mice can induce alterations in heart rate, so awake mice require a significant acclimatization period (1 week) prior to recording.
- Reliable and reproducible ECG recordings require strict control of interfering factors such as body temperature, depth of anesthesia, and body/ lead positioning.

### C. MATERIALS

Non-invasive monitoring:

Awake:

- Non-invasive ECG recording pad (i.e. ECGenie by Mouse Specifics, Inc.)
- Analysis platform (i.e. EzCG by Mouse Specifics, Inc.)

Sedated:

- AD Instrument Power Lab 26T
- Subcutaneous ECG needles
- Isoflurane anesthesia apparatus
- Analysis platform

Invasive ambulatory monitoring:

- AD Instrument Power Lab 26T
- Implantable ECG transmitters (Data Sciences International)
- Isoflurane anesthesia apparatus
- Analysis platform

## D. METHODS

### 1) Non-invasive monitoring:

#### a. Awake

- Place mouse on recording platform
- Allow to acclimate for 10 minutes prior to recording
- Capture and store data for mouse ECG
- Analyze using associated software program

#### b. Sedated

- Light toe pinch will be used to assess adequacy of sedation
- Once anesthesia has been successfully achieved, four subcutaneous ECG needle electrodes (akin to 27gauge needles) will be placed
- ECG will be recorded using a dual bioamplifier (AD Instrument, PowerLab 26T).
- Analyze using associated software program (ADInstrument, LabChart)

### 2) Invasive ambulatory ECG monitoring:

- The mice will be completely anesthetized (either IP injection or inhaled isoflurane)
- A small area of fur will be removed from the animal's back using clippers
- The area is prepped and skin cleaned with anti-septic solution
- A small 2-cm midline incision is made and a subcutaneous pocket is created by blunt dissection
- A sterilized transmitter will be placed aseptically and sutured to the muscle
- The leads are directed cranially and anchored under each forelimb into a position that mimics ECG lead II position for long-term recording, analogous to artificial pacemaker implantations in humans.
- Following telemetry monitor implantation, the animals will be allowed to recover.
- Post-procedural analgesia will be administered as needed for pain. The transmitter will not be painful to the animals following surgical recovery
- Once the mice have successfully survived the implantation procedure and returned to their normal behavior (i.e. grooming, foraging), they are stabilized in the animal facility for at least 1 week prior to recording.
- After the stabilization period has been completed, without any noticeable signs of distress, their electrocardiograms will be monitored during regular physical activity

## **E. EVALUATION AND INTERPRETATION OF RESULTS**

- Heart rate range and variability
- Intervals including RR, PQ, QT
- Rhythm abnormalities including ectopy and AV block

## **F. REFERENCES**

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